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FACTORY

MANAGEMENT AND MAINTENANCE

OCTOBER 1953

– Operations Research – a sharper tool for your tougher problems . . . . p. 113

– Plant Layout Revision Starts Near-Revolution in Methods . . . p. 134

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Sad Case of Company X

or a good industrial relations program gone wrong . . . p. 84

– PLUS 19 ADDITIONAL ARTICLES AND 15 REGULAR DEPARTMENTS

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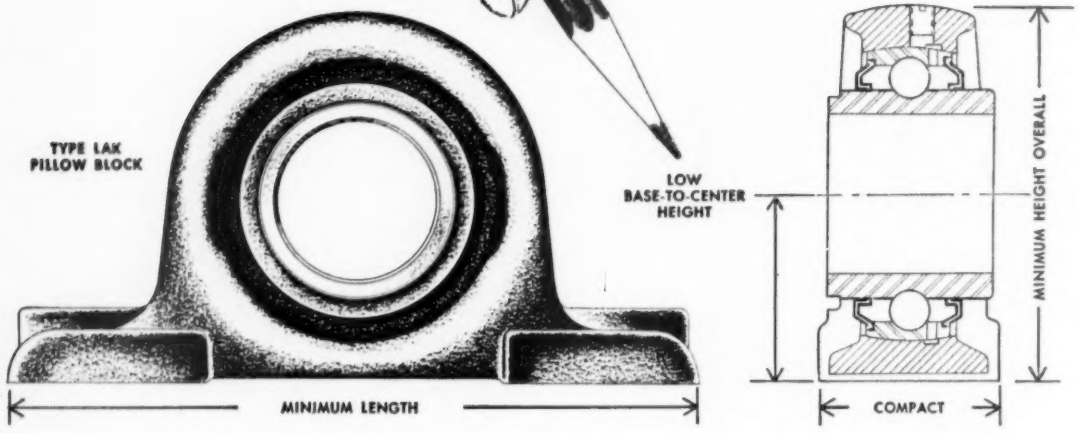
preference points on power transmission units

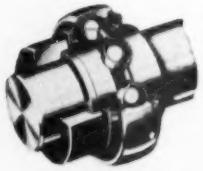
Space-saving dimensions



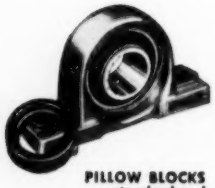
The compact, overall dimensions of Fafnir Ball Bearing Power Transmission Units are frequently mentioned as an important reason for their selection. The saving of fractional inches in space solves many a design problem.

In most cases, Fafnir housings are designed as streamlined, one-piece castings with strength equal to or greater than the bearings they incorporate. All dimensions, particularly from *base to center height* and *overall width* are held to a minimum to conserve space and reduce unnecessary weight. The bearing is supported over its entire circumference, thus the units can be mounted in any position.

Consider space-saving dimensions along with other advantage-points when you need power transmission units. In point-by-point comparisons, space-saving may head the list. Your Fafnir Distributor has dimensions of all units. The Fafnir Bearing Company, New Britain, Conn.



WIDE INNER RING BALL BEARINGS
. . . with Self-Locking Collar and Mechani-Seals



PILLOW BLOCKS
. . . standard and heavy series

FLANGE CARTRIDGES
. . . standard and heavy series

CYLINDRICAL CARTRIDGES
. . . standard and heavy series

FAFNIR
BALL BEARINGS
MOST COMPLETE LINE IN AMERICA

RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER

RECEIVED
8-53

New self-cleaning belt grips better, saves space, lasts longer

B. F. Goodrich belt offers many savings, yet costs no more

HERE'S a radically new conveyor belt, called Griptop, that can carry bags, packages, crates, all sorts of things at steep angles never possible before and so make important savings in space, equipment and time.

It's the improved design with flexing ribs that gives this belt its nonslip, gripping action. Parallel ribs of rubber are cross cut into thousands of flexible grip blocks—more than 5,700 to the square foot. The tiny, rubber blocks are tough enough to stand years of use, yet soft so they bend just enough to grip anything carried by the belt and move it safely, surely. The belt is self-cleaning, too, so there's no danger of it becoming clogged and losing its gripping action. Unlike rough surface belts, the ribs of rubber fan out as the Griptop travels around the pulley to discharge spilled material.

With this new B. F. Goodrich belt, it's now possible to design installations for higher incline angles and so make substantial savings in conveyor lengths and floor space. For example, just by increasing the incline angle from 30° to 45°, a 29% shorter conveyor can be used, 42% less floor space is needed.

With all these features, it's easy to see why this new B. F. Goodrich belt is making many materials handling jobs cheaper, more efficient. Before you buy another replacement belt or design a new installation, let a BFG distributor show you how this unusual belt can cut costs in your plant. Or send the coupon below for more information.

The B. F. Goodrich Company
Dept. M-103, Akron 18, Ohio

Without obligation, please send folder on:

- ☐ Griptop belt.
- ☐ other products (name type) _____
- ☐ Have a BFG distributor see me.

Name _____

Company _____

Address _____

B.F.Goodrich
INDUSTRIAL PRODUCTS DIVISION

FACTORY
MANAGEMENT AND MAINTENANCE

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OF PLANT MANAGEMENT
FOR 62 YEARS

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ARE HIGHLIGHTED HERE

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138 **IT USED TO TAKE 40 GIRLS. NOW IT TAKES 10 TO DO** an order-tally at John Plain Company. A high-speed electronic device, with a magnetic memory system, makes it possible.

150 **TUNG-SOL FINDS A WAY TO GET NEW OPERATORS OVER** the critical period while they're learning to increase speed.

COMING IN NOVEMBER

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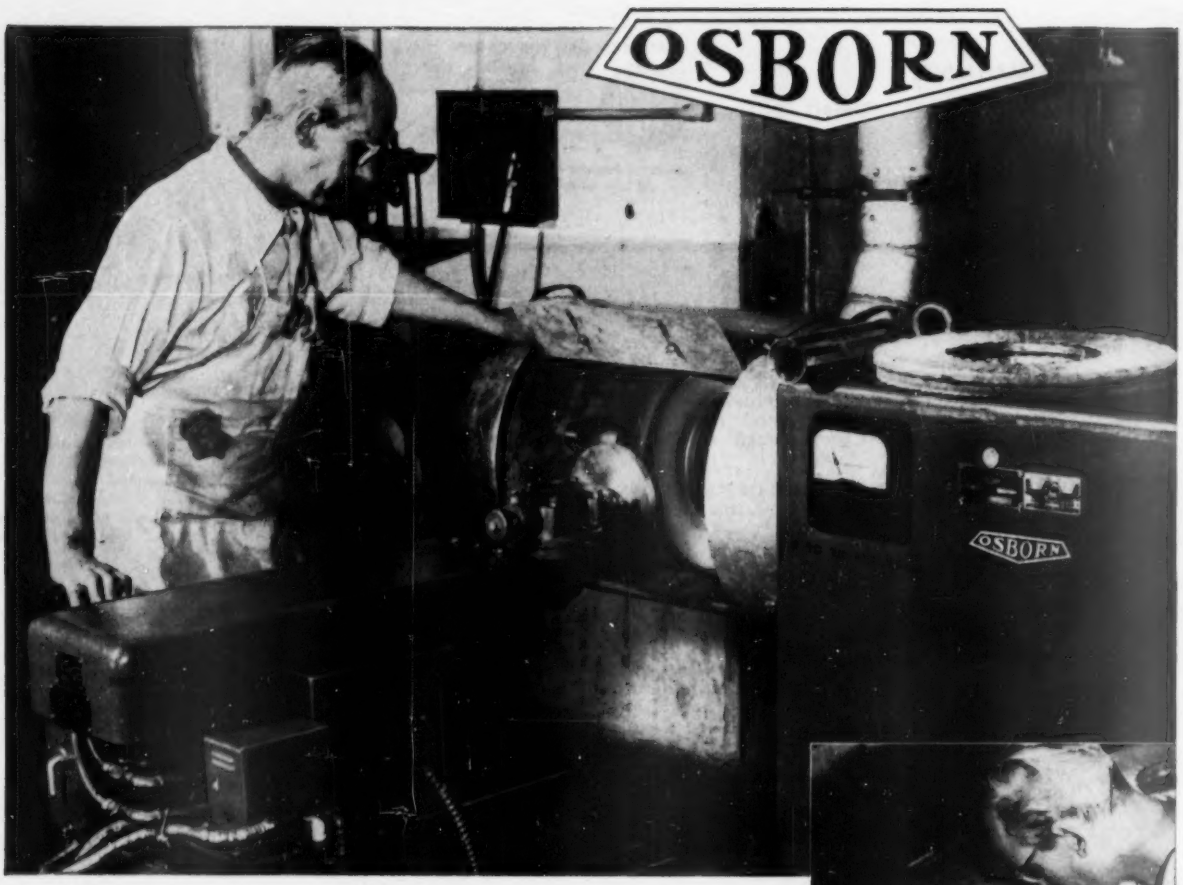

Cuts burr removal time 50% ... greatly improves quality

Power Brushing of transmission gears removes burrs and blends surface junctures automatically. It has paid off 5 ways for a large East Coast manufacturer of aircraft parts.

Their Osborn Brushing Machine produces a uniform required rounding of .030" to .090". It accommodates gears and splines of most types, internal and external. It is easy to adjust for small gear lots and production runs of from 15 to 5,000 pieces. It eliminates costly scrap. *And* less effective hand method time was cut almost 50%.

Production bottlenecks and ineffective finishing departments in *your* plant can be reduced, often eliminated, with Osborn Power Brushing methods.

Find out how you can cut *your* costs . . . improve your workmanship. For new bulletin, Automatic Deburring, call in your nearby **O**sborn **B**rushing **A**nalyst for complete information, or write *The Osborn Manufacturing Company, Dept. H-10, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

Osborn Brushes

Operator can set up in a few minutes. Work is power rotated against the face of the brushes. A pre-set timer controls length of the cycle and retracts the holder.

Old method of hand burr removal was inaccurate, costly and time-wasting.

SEE THIS BRUSHING METHOD DEMONSTRATED AT METAL SHOW — BOOTH 1030

Better see H&D!

Our 65th Year

H&D

HINDE & DAUCH

ADD *Extra* YEARS

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USE STEEL-GARD

for Long Life Protection of Metal Surfaces

You get extra years because Steel-Gard primers and finishes use a long linseed oil vehicle. Down through the years no drying oil has approached the record of linseed oil for durability, elasticity and the all-important *protection of the edges.*

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You get extra years of top appearance because of Bakelite and styrene additives that provide a higher gloss, longer gloss retention, greater alkali, moisture and fume resistance.

And in every gallon of Steel-Gard you get the priceless ingredient of *65 years experience* in the manufacture of metal protective paint for industry.

Write today for Steel-Gard Specification Chart No. A-1 which contains chips of standard colors and complete information.

PAINT • VARNISH • ENAMELS *"all colors for all purposes"*

Detroit Graphite Company

DIVISION OF THE VALSPAR CORPORATION

880 12th STREET • DETROIT 16, MICHIGAN

SERVING INDUSTRY DIRECT

How WESTINGHOUSE saves $37,000 yearly at its Trafford, Pa. Foundry

■ This plant formerly loaded and unloaded bagged material, handled barrels and stored patterns by manual methods. Today fork trucks have mechanized all these operations. Result: *an annual saving of $37,000.*

In the warehouse, for example, the fork trucks now stack materials on pallets—right up to the rafters. Indirect benefits: space saving, fewer accidents, less material damage. Direct benefits: substantial savings in labor costs.

Fork-truck handling and tiering of patterns eliminated back-breaking work, increased storage capacity 500% and made additional labor savings.

Unloading bagged material (wood flour, sea coal, mogal, pich, etc.) and fire brick (formerly manhandled one at a time) is now done in palletized unit loads—another big cost saver. And still more money is saved by handling barrels with a Baker 4-Purpose Carriage truck and drum shoes.

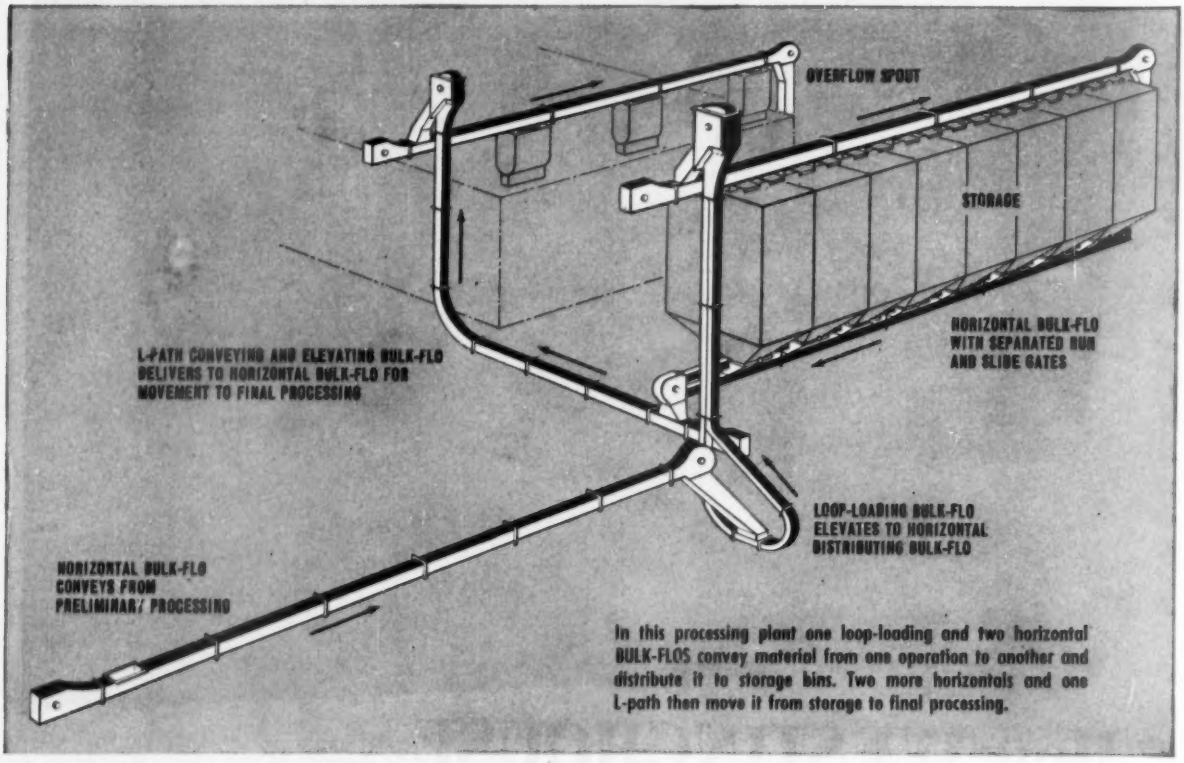
Baker
industrial trucks

write for 6-page special report on the application of Baker attachments to various loads.

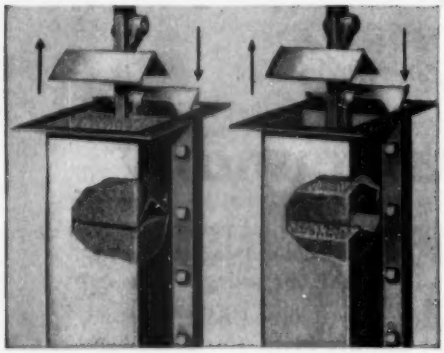
THE BAKER-RAULANG COMPANY
1218 WEST 80th STREET • CLEVELAND 2, OHIO

BAKER-LULL Corporation, *Subsidiary*, Minneapolis, Minn.
Material Handling and Construction Equipment.

Link-Belt BULK-FLO combines feeding - conveying - elevating . . .


OVERFLOW SPOUT
STORAGE
HORIZONTAL BULK-FLO WITH SEPARATED RUN AND SLIDE GATES
L-PATH CONVEYING AND ELEVATING BULK-FLO DELIVERS TO HORIZONTAL BULK-FLO FOR MOVEMENT TO FINAL PROCESSING
LOOP-LOADING BULK-FLO ELEVATES TO HORIZONTAL DISTRIBUTING BULK-FLO
HORIZONTAL BULK-FLO CONVEYS FROM PRELIMINARY PROCESSING

In this processing plant one loop-loading and two horizontal BULK-FLOS convey material from one operation to another and distribute it to storage bins. Two more horizontals and one L-path then move it from storage to final processing.



Fully or partially loaded—Link-Belt BULK-FLO provides positive, gentle movement of material. Self-clearing through intermediate runs, it prevents contamination.

to cut your handling costs

Now—with *one* fully enclosed assembly—you can replace several handling units in less space . . . at lower cost. BULK-FLO combines three functions in one, offers true versatility in bulk material handling.

Operating independently of internal pressure, its solid flights provide positive, variable movement of material even at less than full capacity. BULK-FLO is gentle, too—individual "compartments" protect the material.

There's a wide range of designs that can be engineered to match your system requirements. For complete information, call your Link-Belt office, or mail the handy coupon included here for your copy of Book 2475.

LINK-BELT

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FEEDERS - CONVEYORS - ELEVATORS

13,204

LINK-BELT COMPANY: Plants: Chicago, Indianapolis, Philadelphia, Colmar, Pa., Atlanta, Houston, Minneapolis, San Francisco, Los Angeles, Seattle, Toronto, Springs (South Africa), Sydney (Australia). Sales Offices in Principal Cities.

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Please send me immediately a free copy of your 28-page BULK-FLO Book 2475.

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Here Are Facts You Should Know About Electric Motor Bearings

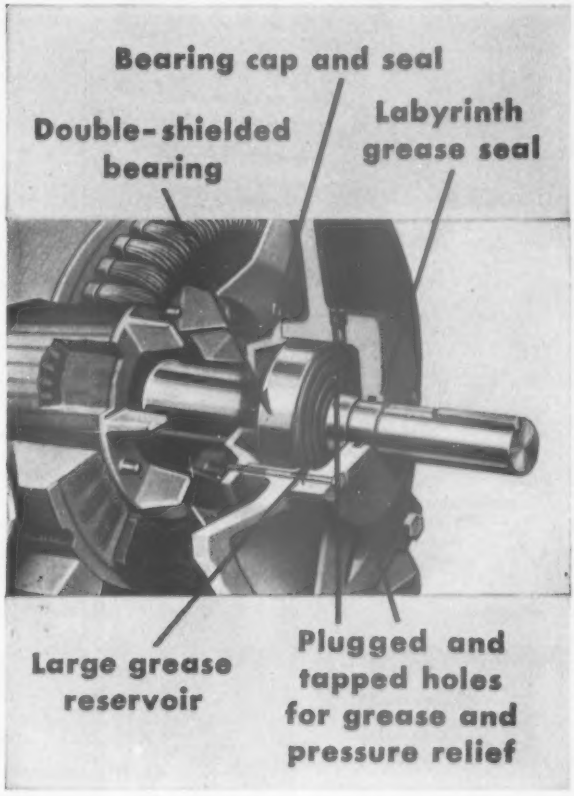
AN ideal motor bearing would operate for indefinitely long periods under all types of conditions without requiring any attention whatever. However, in the opinion of our engineers, such a bearing and its attendant lubricant are not yet available on the commercial market. Consequently, bearings for many types of operations, particularly where overloading, extreme temperature ranges and chemical and dirt laden atmospheres are involved, require special lubricants or regular lubrication schedules.

Of course, bearings suitable for many kinds of operation under normal conditions can be built to require no attention for very long periods — usually several years. Allis-Chalmers can supply sealed bearings in all frame sizes through 505 on short delivery and without extra cost for applications of this type.

Which is the Best Design for *Your* Application?

We believe that the design used in standard Allis-Chalmers drip-proof, tefc and explosion-proof motors represents the best design for most industrial users.

The Allis-Chalmers standard design consists of a pre-lubricated, double-shielded bearing mounted in the end housing with a generous grease reservoir. Plugged and tapped holes are provided for grease and for pressure relief. Under normal operating conditions, this design will operate as long without attention as any other type of bearing in use today. But where difficult operating conditions make re-lubrication desirable, it can be done as part of the normal lubricating routine without dismantling the motor.


Bearing cap and seal
Double-shielded bearing
Labyrinth grease seal
Large grease reservoir
Plugged and tapped holes for grease and pressure relief

The large grease reservoir and shielded bearing design assure that grease lost from the bearing due to high operating temperatures or other causes will be replaced automatically.

For further information on bearing design and other features of Allis-Chalmers motors, call your nearby Allis-Chalmers District Office or Authorized Distributor.

A-4147

ALLIS-CHALMERS

Milwaukee 1, Wisconsin

GRINNELL announces its new line of

GAS-FIRED UNIT HEATERS

Grinnell
Available in 7 sizes — with input ratings from 25,000 to 200,000 Btu's.
All parts readily accessible for periodic servicing.

AUTOMATIC! EFFICIENT! ASSURE YEARS OF DEPENDABLE SERVICE

Grinnell gas-fired unit heaters are easy to install, simple to operate and maintain. Efficient performance assured — with any type of gas — by modern design of burners and heat exchanger, proper motor and fan unit.

Automatic safety pilot operates to shut off main gas supply if pilot burner goes out. Flashback and extinction noise prevented by the burners' raised port design and proper port size for the gas used. Low speed motors have built-in thermal overload protection and automatic reset.

Additional features of Grinnell *gas-fired* unit heaters . . .

- Casing die-formed of heavy steel, with baked-on enamel finish
- Heat exchanger tubes and draft diverter of aluminized steel
- Combustion chamber of heavy steel, welded
- Burners of close-grained iron castings
- Adjustable louvers
- Burners and control assembly removable as a unit
- Hinged bottom pan permits cleaning interior of tubes
- Threaded pipe hangers for easy suspension
- Only wiring required is connection to room thermostat or manual switch
- Approved by the American Gas Association

WRITE FOR CATALOG

GRINNELL
UNIT HEATERS FOR STEAM, HOT WATER, GAS

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

Manufacturer of: pipe fittings • welding fittings • forged steel flanges • steel nipples • engineered pipe hangers and supports
Thermolier unit heaters • Grinnell-Saunders diaphragm valves • prefabricated piping • Grinnell automatic fire protection systems

Here's how to plot a plane's Angle-of-Climb...

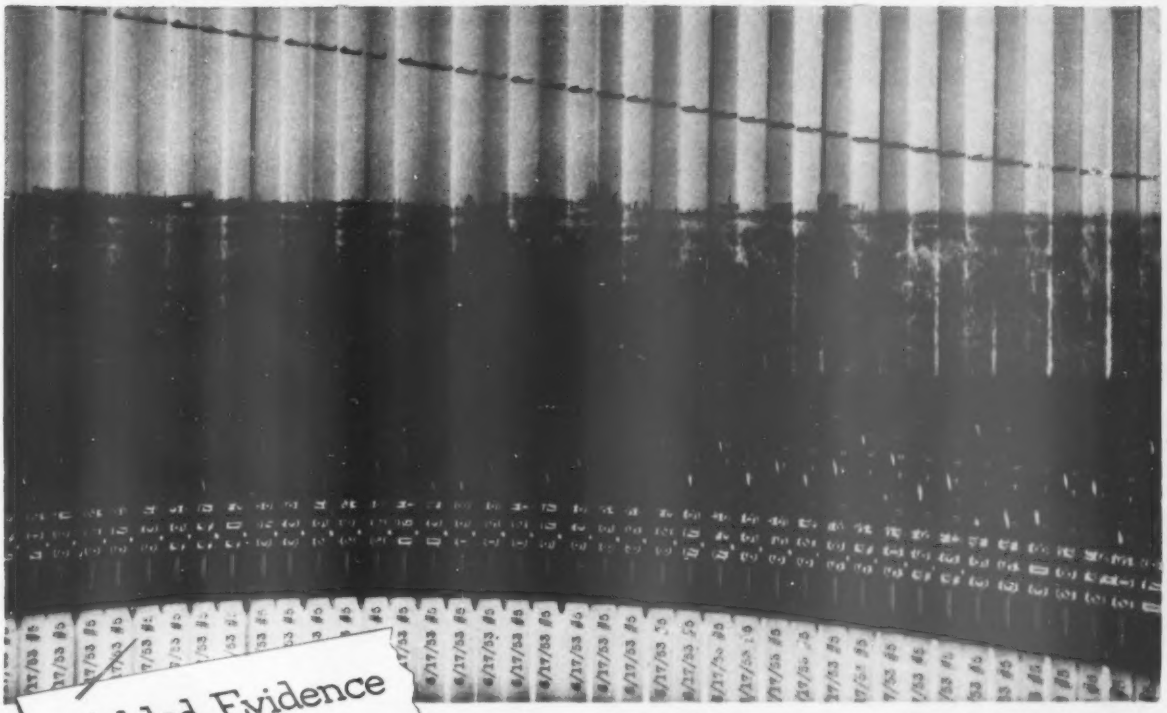


Photo by Sherman Fairchild & Associates' Flight Analyzer Camera, New York City

Added Evidence that—

Everyone Can Count on VEEDER-ROOT

New take-off technique yields an 8° climb, as this progressive *single photo* shows. And this is 100% improvement over old techniques . . . increasing safety and decreasing noise-annoyance at city airports.

Here you actually see 53 separate exposures. And each, reading from bottom up, shows the date and number of the flight photographed. Next above is a device which records the time ...exact to 1/1,000th of a second. And in the heart of this device is a Veeder-Root Counter.

So here again you see one of the heretofore uncounted ways in which "Everyone Can Count on Veeder-Root". What's *your* problem? Let us put our mathematical eyes on it. Write:

VEEDER-ROOT INCORPORATED
HARTFORD 2, CONNECTICUT

Chicago 6, Ill. • New York 19, N. Y. • Greenville, S. C.
Montreal 2, Canada • Dundee, Scotland
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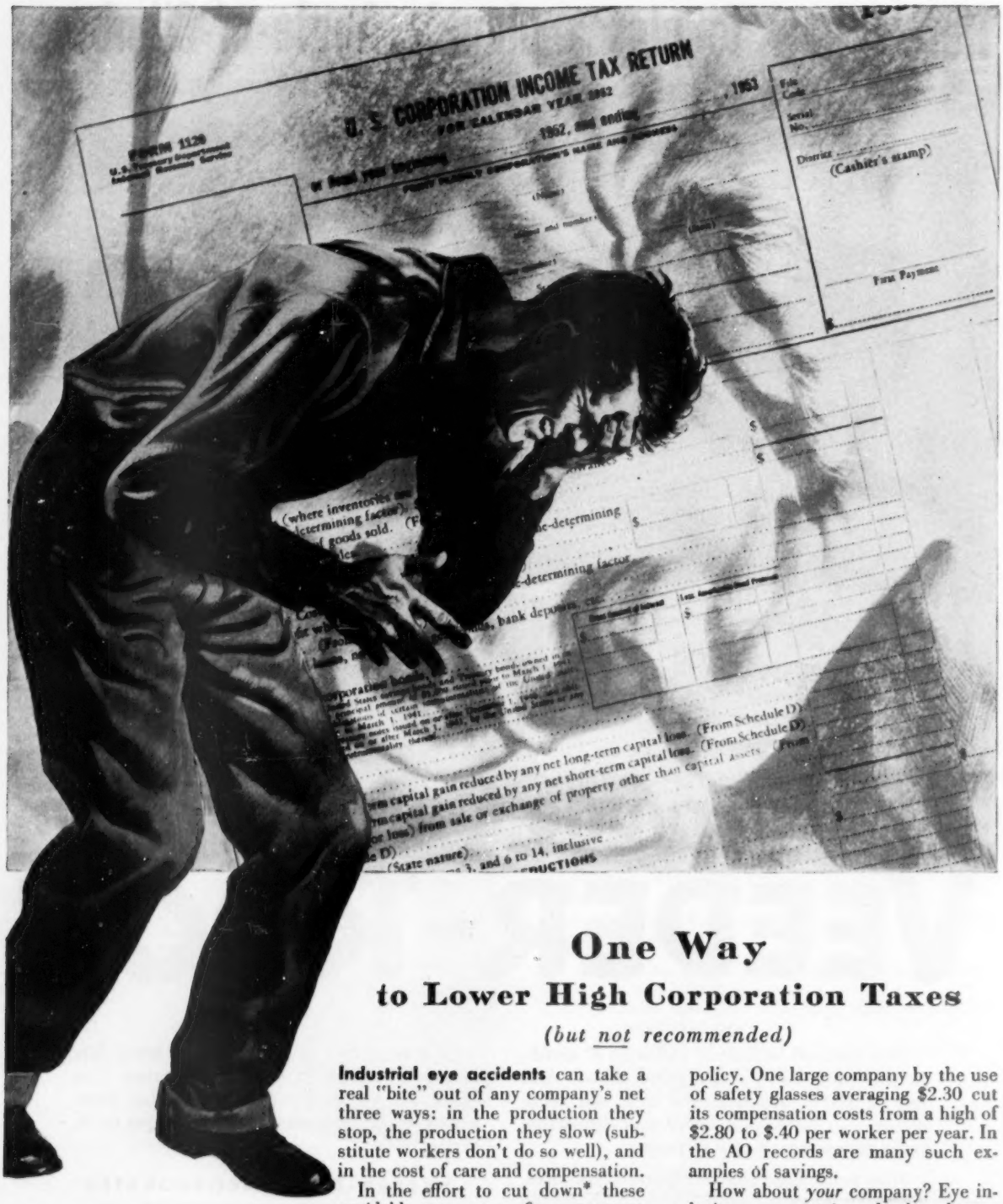
"The Name that Counts"



One Way
to Lower High Corporation Taxes
(but not recommended)

Industrial eye accidents can take a real "bite" out of any company's net three ways: in the production they stop, the production they slow (substitute workers don't do so well), and in the cost of care and compensation.

In the effort to cut down* these avoidable taxes on profits, a program that safeguards a valued worker's eyes is sound policy. One large company by the use of safety glasses averaging $2.30 cut its compensation costs from a high of $2.80 to $.40 per worker per year. In the AO records are many such examples of savings.

How about *your* company? Eye injuries are as *certain* as death and taxes unless there is a program that controls them. Ask your AO Safety Representative for complete details.

"Stay in the Safety Zone with AO Safety Equipment"

American Optical
SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

*98% of eye injuries are *eliminated* when workers wear safety goggles.

AO's *Industrial Vision Program* increases Production, Decreases Accidents. Write today for booklet "Improved Industrial Vision" to American Optical Company, 5310 Vision Park, Southbridge, Mass.

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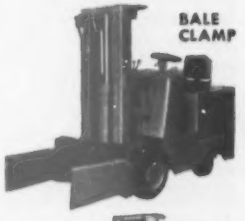
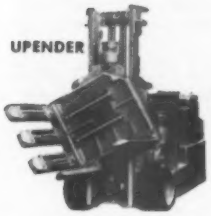
GIANT WITH 19 HANDS

One Elwell-Parker gives you the strength of a giant—more muscle power than 10 men. And giants' hands could not be more dextrous than the ingenious fork truck with attachments illustrated. They are a product of Elwell-Parker's 45 years' experience, gained while solving scores of unusual handling problems. Truly, Elwell-Parkers can be made to do almost anything but think—our engineers do that! The Elwell-Parker Electric Company, 4029 St. Clair Avenue, Cleveland 3, Ohio.



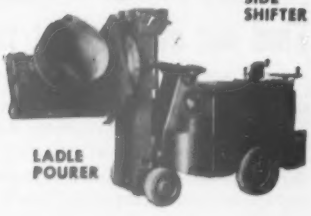


ELWELL-PARKER

POWER INDUSTRIAL TRUCKS

Established 1893

FREE BULLETIN on E-P ATTACHMENTS Write for your copy now.



MATERIALS-HANDLING NEWS

★ Panel Discussions by Bassick, World's Largest Manufacturer of Casters and Floor Protection Equipment ★

This pair of Bassick newcomers can cut your handling costs

New heavy-duty "Form-Forged" caster shoulders loads up to 1500 lbs.

S6992-2 "Form-Forged" Caster with 2½" tread wheels and load rating of 1500 lbs.

This new Bassick "Heavy-Duty" steel caster offers new highs in performance at a new low in cost. It harnesses the easy action of precision-formed raceways to a frame that's built extra strong to take the punishing loads of powered assembly-line dollies, and equipment. You can get it in 5", 6", 8" and 10" sizes, with semi-steel, forged steel or rubber-tread wheels. First cost is low, and its rugged construction enables it to stand up under the toughest operating conditions – which means lower maintenance costs. Take a look at these important features:

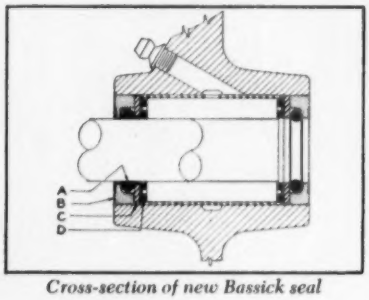
Double Ball Race – for efficient, easy motion

Extra-Heavy King Pin – for full protection at this critical point

Fully Hardened Raceways – for years of dependable service

Structurally Shaped of Heavy-Gauge Steel – for safe support of heavy loads

New low-cost sealed bearings for industrial rubber-tread wheels



Cross-section of new Bassick seal

This drawing of the new Bassick seal shows its simple design which assures low first cost plus long service life. Parts listed below form baffled path that lubricant has a hard time travelling. The wheel retains its lubricant and foreign matter is kept out.

The sealed bearing can be regreased by standard methods through regular Alemite fittings. It's particularly effective in preventing entrance of dust, water spray and steam-cleaning fog. Now available on a growing number of Bassick wheels.

A. Neoprene "O" ring is in elastic contact with axle shaft . . . does not turn.

B. Powder metal outside seal washer is press-fitted in hub of wheel and turns with wheel.

C. Steel roller bearing retainer washer rotates with wheel.

D. Roller bearing end cage washer.

Find out more about these new Bassick products today

Check your industrial distributor salesman for facts and figures on these two new cost-cutting Bassick developments. Or write direct to us. Either way you'll receive a prompt reply to your inquiry. You'll also receive the full story on the new "Form-Forged" Steel Caster and the new Sealed Bearing Wheels—a story that will prove once more that when it comes to industrial casters and wheels . . . it pays to come to Bassick.

Monkey-Savers

We recently received a letter from a New Orleans monkey fancier. Turns out that Bassick casters have one use we never thought of – they help keep monkeys healthy. Here's how our New Orleans friend tells it:

"Your casters have been put to very good use. As you may know, monkeys are susceptible to all the diseases of humans, and in particular, colds and pneumonia. I have found it quite advantageous, with the use of Bassick casters, to roll the cage into a sheltered garage on cold, rainy days, and out into the yard again when the sun shines. They make one cage do the work of two. Also, they simplify cleaning the cage, as I simply roll it over to the drain and hose it out. Bassick casters are real Monkey-Savers."

Whether you're handling materials or monkeys, it seems, you'll save time and money by putting Bassick casters under them. Your Bassick industrial distributor will help you pick the right type. Or write us.

THE BASSICK COMPANY
Bridgeport 2, Conn.

In Canada:
Belleville, Ont.

Bassick
A DIVISION OF STEWART SW WARNER

MAKING MORE KINDS OF CASTERS . . . MAKING CASTERS DO MORE

Try this Proved way to bigger profits...

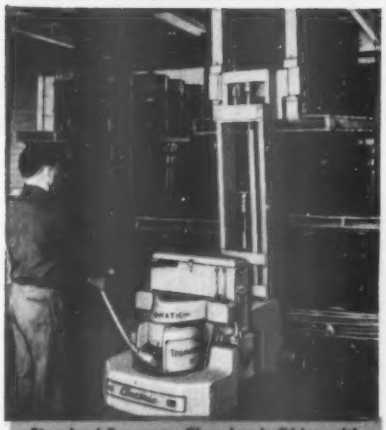
COST CUTTING Automatic® ELECTRIC TRUCKS

One man with Automatic Transporter, handles 4000 lb. loads (all he handled manually was 1500 lbs.)—50% faster. Saving: two-thirds in total time and costs for Continental Gin Machinery plant in Alabama.

When you take more time to do a job than you'd have to with *really modern* equipment, your costs, too, are higher—your profits less! That's why so many progressive firms (as in applications shown on this page) are switching to modern Automatic Electric Trucks.

You see, Automatic makes a truck for practically every kind of materials handling job...to do *that* specific job at low cost —*profitably!* Thus your Automatic truck is never *under*-powered and inefficient, nor *over*-powered and costly to operate... it's "keyed-to-the-job" for maximum efficiency, minimum cost!

To know what Automatic trucks can do for you in cutting costs and speeding production, simply mail the coupon below —today.



Standard Brewery, Cleveland, Ohio, with Automatic Transtacker, stores 400 lb. Caustic Soda Drums, 4 to the pallet, 3 pallets high—bottle cases 72 to the pallet, 23 cases high. Saves 40% of valuable storage space.

Example for any commodity in bags. Armstrong varnish plant, Chicago—where Automatic Transporters carry 5000 lb. loads (100 bags per skid) saving thousands of man-hours yearly—receiving, handling, storing, shipping.

Automatic supplies special attachments for special jobs. Here special clamps on Automatic Skylift trucks permit vertical stacking of 1470 lb. rolls received horizontally. Save 20% storage space for Bemis Bro. Bag Co., Mobile, Ala.

Send today for Automatic cost-cutting case histories in YOUR industry.

Automatic

WORLD'S LARGEST EXCLUSIVE BUILDER OF ELECTRIC DRIVEN INDUSTRIAL TRUCKS

Automatic 39 West 87th Street, Dept. T-3 Chicago 20, Illinois.

Please send complete Free information on Automatic Trucks, with case histories that apply to my business.

Company Name _____

By _____

Street Address _____

City _____ *Zone* _____ *State* _____

Putting Air to Work For Bell Telephone: delicate relays and switches thrive on dirt-free air.

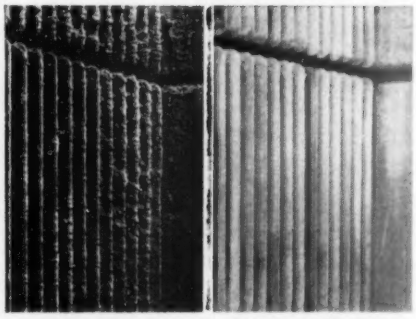
Electronic Air Cleaning

IMPROVES YOUR TELEPHONE SERVICE

Every time you dial a number, over 900 tiny contacts are set in motion. A speck of dirt in any of them may delay your call, so offices must be kept clean. That's why Bell gives their equipment the "kid glove" treatment.

In many Bell System exchanges in centers of heavy industry, Westinghouse PRECIPITRON®, the electronic air cleaner, keeps air at its highest purity. It traps the fine particles of dust and dirt which pass right through conventional filters. Result: better service for you; reduced maintenance costs for the exchange.

Chances are airborne dirt is costing *you* money. For example, in cleaning expense, in rejects, in damage to equipment or processes. For help on problems of air cleaning, air handling or air conditioning call your Westinghouse-Sturtevant office. Westinghouse Electric Corp., Sturtevant Division, Hyde Park, Boston 36, Mass.



Dirty Plates **Clean Plates**

PRECIPITRON is the most efficient commercial air cleaner available. All dirt particles receive an electric charge, are attracted and cling to collector plates of opposite polarity. Periodically they are flushed down the drain.

Photo above left shows amount of dirt collected on PRECIPITRON plates after 2½ weeks. Photo at right shows plates after cleaning.

WESTINGHOUSE AIR HANDLING

YOU CAN BE SURE ... IF IT'S Westinghouse J-80319

Fawick Airflex Division, Federal Fawick Corporation plant in Cleveland, Ohio, looks clean, bright and pleasant three years after being painted according to COLOR DYNAMICS.

Better, Safer Working Conditions... with Pittsburgh COLOR DYNAMICS*

Choice of right colors for walls, ceilings and machines improves workers' morale, reduces housekeeping and accident hazards in modern plant of largest manufacturer of pneumatic clutches and brakes.

*Trade Mark Reg.

FAWICK Airflex

THE THREE-YEAR experience of Fawick Airflex with Pittsburgh COLOR DYNAMICS adds convincing proof that wise and careful use of color is a profitable investment that benefits both management and workers.

● **The Fawick Airflex Division** of the Federal Fawick Corporation is the largest manufacturer of pneumatic clutches and brakes for all types of industrial machinery.

● **This plant** was painted according to COLOR DYNAMICS early in the summer of 1950. Morale-building colors with high light reflectance were used on ceilings and upper walls, making the entire work area brighter and more cheerful. Eye-rest colors were used on lower walls to lessen eye fatigue. The machinery was painted with focal and eye-rest colors to permit the operator to see his job better. Safety colors were applied on operating controls, mobile equipment and traffic lanes to increase safety.

● **No better summary** of the satisfactory results that were achieved can be made than this comment by R. S. Huxtable, President of the Federal Fawick Corporation:

● **"COLOR DYNAMICS** has raised efficiency and productivity in our plant. Also, we are certain that the improvement in morale and in our relations with the working force has fully justified our selection of COLOR DYNAMICS. Being proud of their pleasant surroundings, our employees help to keep their work areas clean. This simplifies housekeeping. Moreover, we have been most pleased with the way Pittsburgh Paints have held up."

Get a FREE Color Engineering Study of Your Plant!

● Painting your plant according to COLOR DYNAMICS costs no more than a conventional maintenance job. Why not investigate what this modern system of putting color to work will do in your factory or office? Send for our free book which explains what COLOR DYNAMICS is and how it works. Better still, call your nearest Pittsburgh Plate Glass Company branch and ask to have a representative give you a color engineering study of your plant, or any part of it, without cost or obligation. Or mail this coupon.

SEND FOR THIS FREE BOOK!

Pittsburgh Plate Glass Co., Paint Div.
Department FM-103 Pittsburgh 22, Pa.

☐ Please send me a FREE copy of your booklet "*Color Dynamics.*"

☐ Please have your representative call for a Color Dynamics Survey without obligation on our part.

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Street_____

City_____ County_____ State_____

PITTSBURGH PAINTS

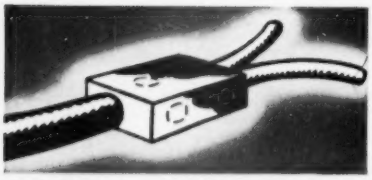
PAINTS • GLASS • CHEMICALS • BRUSHES • PLASTICS • FIBER GLASS

PITTSBURGH PLATE GLASS COMPANY

IN CANADA: CANADIAN PITTSBURGH INDUSTRIES LIMITED

Copr. 1953, Pittsburgh Plate Glass Co., Pittsburgh, Pa.

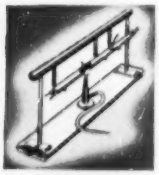
How to get longer life out of your portable cords and cables!



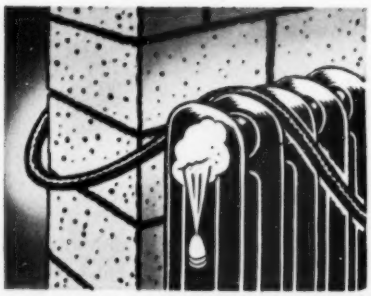
1 USE junction or distribution boxes for making multiple power connections in working places.

2 PROTECT cables with fuses or circuit breakers of the proper rating for the service. Make sure that circuit breakers will operate properly.

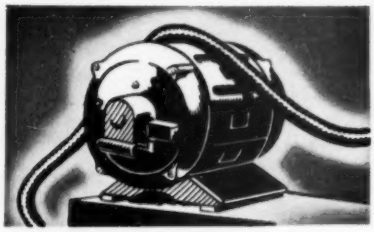
3 PROTECT cables from being run over by heavy equipment. Running over the cable a few times may not cause immediate failure, but may do internal damage which will shorten its life. If the cable must be run across an aisle, place boards on either side as one would for a hose. If it is in use for only a short time, it should be thrown over the truck.



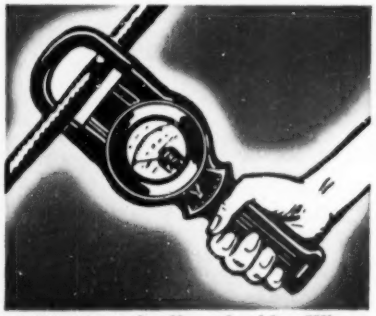
4 USE flame-resistant cables wherever possible.



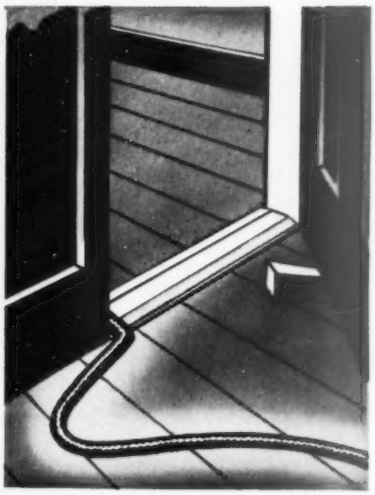
5 DO NOT have portable cords and cables running over steam pipes or other heat-transmitting equipment.



6 KEEP cables away from sparking motors and high voltage equipment. The ozone generated by sparking commutators attacks rubber jackets, causing cracking.



7 AVOID overloading of cables. Where possible, use I.P.C.E.A. recommended current ratings.



8 AVOID dragging portable cords around rough edges or sharp corners. Bruises and cuts hasten deterioration of the jacket. Never yank cords to remove kinks or loosen them when caught on a projection.

9 AVOID running portable cables on pulleys or drums too small for the size of the cable; observe recommended I.P.C.E.A. minimum diameters.

10 KEEP cords away from oils and greases. If they do get into oil, they should be wiped off as soon as possible. Avoid having cords lie in pools of water, chemicals or grease.

11 BUY cables that can carry the required current without overloading or overheating. They should be flexible (have sufficiently fine strands) for the intended use.

FOR FREE REPRINTS OF THIS PAGE, WRITE TO ADDRESS BELOW.

UNITED STATES RUBBER COMPANY

U.S. RUBBER
SERVING THROUGH SCIENCE

Electrical Wire and Cable Department

ROCKEFELLER CENTER • NEW YORK 20, NEW YORK

Carl Rosen, President of Puritan Dress Company, tells how . . .

He leads the world's biggest dress parade!

"Fashions are perishable," says Carl Rosen, head of the world's largest women's dress house. "The season is short — *speed* is the essence.

"First we test new styles in key markets to see how they click. New dresses reach the stores on time — via Air Express.

"Then we release the best styles, timed to go on sale when our 2-page ads appear in Sunday papers all over the country. Those dresses reach every part of the nation overnight — via Air Express. Finally, our efforts pay off in a flood of reorders!

"And again we turn to Air Express, to replace stocks as fast as they sell out. This dependable speed is the lifeblood of our business. It is absolutely essential to us.

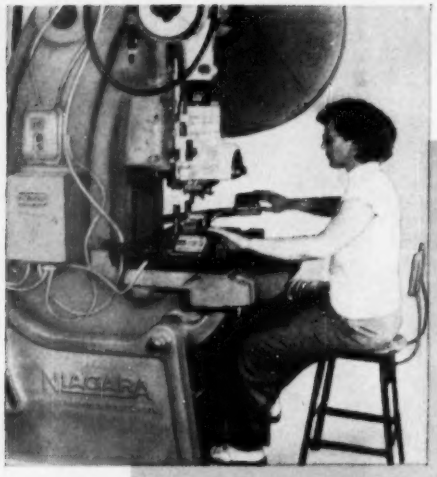
"Yet the majority of our Air Express shipments go at *lower rates* than any other commercial air service.

"Buyers and salesmen know they can depend on us. We depend on Air Express!"

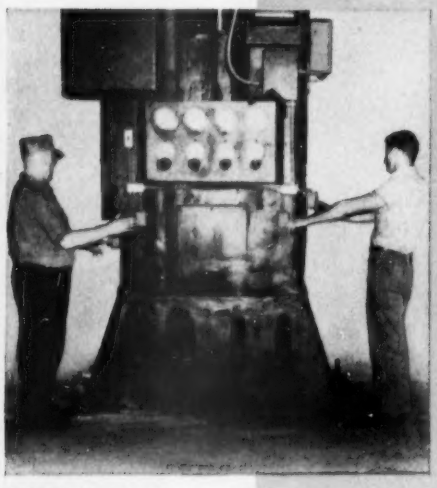
It pays to express yourself clearly. Say Air Express! Division of Railway Express Agency.

Air Express

GETS THERE FIRST *via U.S. Scheduled Airlines*



Two-hand **MICRO** trip control on punch press. It is controlled by feather-touch actuation of both switches at the same time.



MICRO trip and selector control. **Requires actuation of four hand switches by the two operators. Can be set for operation by one to four switches.**

MICRO trip provides automatic cycling control on huge paper cutter. Operator holds two switches until cut is made.

MICRO trip users report up to 20% increased production from power presses—with *SAFETY*

• MICRO trip electrical clutch controls provide instantaneous electrical response. Their light-touch actuation reduces operator fatigue. They permit operators of punch presses, power shears, hydraulic presses and other power machines to work with complete freedom from worry.

MICRO trip cannot be "cheated." It is a two-handed tripping device so designed as to prevent tying, wedging or otherwise securing one switch so as to operate with one hand only. Any component failure automatically breaks the clutch operating circuit. It affords complete protection to machine operators and set up men.

MICRO trip also may be used with single switch control in circumstances where one hand is otherwise occupied. It is also ideal for multiple operator installation. Electrical signal systems can be tied in with MICRO trip. MICRO trip permits single stroke control for positive mechanical clutch machines and automatic cycling control for hydraulic, pneumatic or friction clutch machines.

Send for MICRO trip catalog today. Write to MICRO, Freeport, Illinois, for name of distributor nearest you.

MICRO

MAKERS OF PRECISION SWITCHES

FREEPORT, ILLINOIS

A DIVISION OF
MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

***Operate* MICRO trip *yourself*...:**
Visit BOOTH 414 at National Safety Congress
October 19-23

You get MORE with Barreled Sunlight Paint

What does it matter if Barreled Sunlight might run a few pennies high per gallon? Look what you get in return.

More per gallon. Barreled Sunlight takes more thinner . . . as much as one gallon of thinner for every five of Barreled Sunlight. And even with all this thinner, Barreled Sunlight's superior hiding power gives you more square yards with solid coverage per gallon. You save by buying less paint.

More per man hour. With Barreled Sunlight, your maintenance painters work faster. The easy flow, freedom from sag, and extra coverage with every brush stroke cuts your labor costs . . . *most important*, because labor usually represents at least 80% of the total cost of the job.

More per dollar. In addition to savings in paint and labor on the original job, Barreled Sunlight saves you money over the years. A Barreled Sunlight job keeps its fresh-painted look longer. You repaint less often . . . and a Barreled Sunlight repaint job is usually a one coat job.

Look into it. With an on-the-wall test, a Barreled Sunlight representative can show you *how much more* . . . per gallon, per man hour, and per dollar . . . you can get with famous Barreled Sunlight. Write and he'll call.

BARRELED SUNLIGHT PAINT COMPANY
2-J Dudley St., Providence 7, R. I.

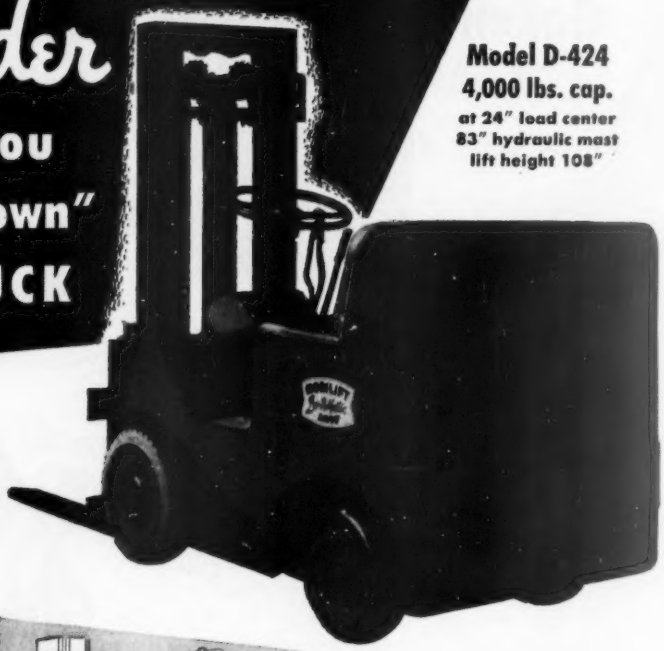
Barreled Sunlight Paints®

In whitest white or clean, clear, wanted colors, there's a Barreled Sunlight Paint for every job

For over half a century those who know the best in paints . . . for all types of buildings . . . have strongly insisted on famous Barreled Sunlight

The All New MOBILIFT 4000 Pounder

Has Everything You Want in a "Sit-Down" FORK LIFT TRUCK



Model D-424
4,000 lbs. cap.
at 24" load center
83" hydraulic mast
lift height 108"

Here are Just a Few of the Trend-Setting Features...

- **Chrysler 65-bhp 6-cyl. Gas Engine.**
- **Chrysler Gyrol Fluid Coupling.**
- **Mobil-Matic Drive** for smooth, positive power transmission through the MOBILIFT Oil-Immersed, Multiple-Disc Clutch and **Constant-Mesh Transmission**—2 speeds forward, 2 reverse.
- **One Lev-R-Matic Control** for forward and reverse... just *Push* to go forward—*Pull* for reverse—NO CLUTCH PEDAL—NO GEARS TO SHIFT!
- **MOBILIFT Full-Floating Drive Axle.**
- **Hydraulic Service Brakes.**
- **Combination Ball-Bearing Worm & Nut Type Steering.**
- **Easy to Get On and Off—no obstructions—free access from left or right side.**
- **One-Piece Hood Raises for Easy Service Accessibility.**

These and many more exclusive MOBILIFT features make this new D-424 the lift truck for you! ...Send coupon for complete details.

MOBILIFT
EASY TO SERVICE
One-Piece Hood hinged for easy access to engine compartment.
DESIGNED FOR OPERATOR COMFORT—SAFETY.
No obstructions on floor. Easy to get on and off from left or right side. Controls and instruments placed for easy reach and view.

MOBILIFT CORPORATION, Dept. A
835 S. E. Main, Portland 14, Oregon

☐ Please send me complete information on the D-424.

☐ Please have your sales representative contact me.

Name_____ Title_____

Street_____ City_____ State_____

Company_____

MOBILIFT CORPORATION

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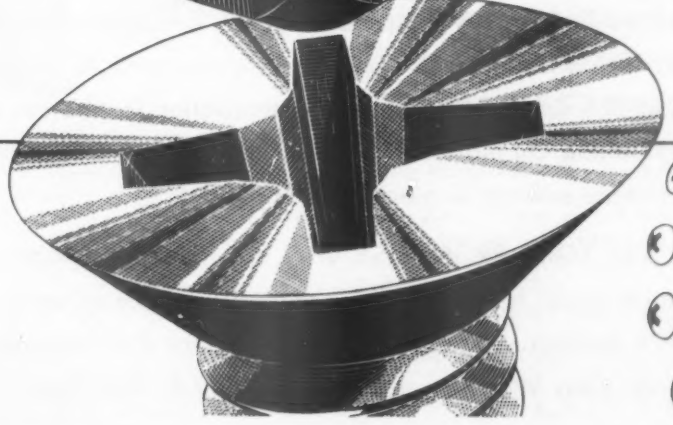
THE AMERICAN STORY

CHAPTER 13

Here there's no patience with "Bad Luck"

Inspection of screws can only be done one way... *the hard way.* And this means close and constant checking for depth and fit of recess . . . for concentricity and appearance of head . . . and for clean and full-formed threads.

For this work, we train the most intelligent eyes we can find. *And we train them not to blink*... not to overlook even the slightest touch of "bad luck" in variation from the letter of the law of American inspection procedures. That's why you get a higher perfection-percentage in every shipment of American Phillips Screws. Write:

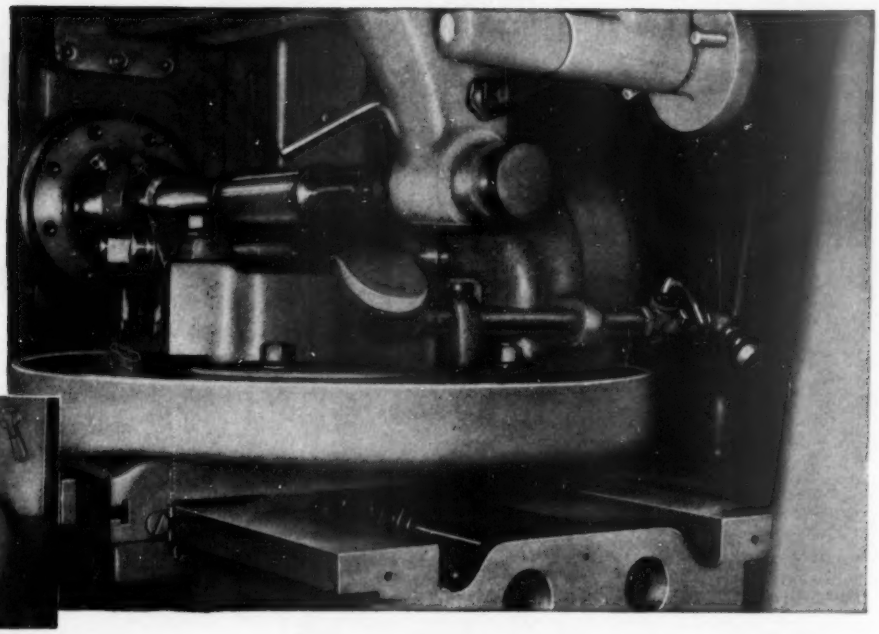


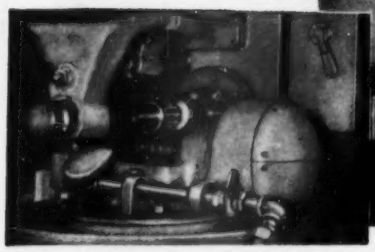
AMERICAN SCREW COMPANY

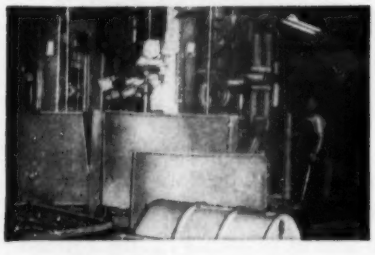
PHILLIPS HEADquarters

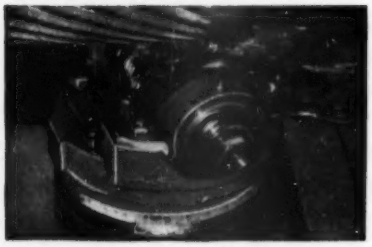
WILLIMANTIC, CONNECTICUT

Main Office & Plant
Willimantic, Conn.
Office & Plant, Norristown, Pa.
Office & Warehouse, Chicago, Ill.









"ON-THE-JOB" CUTTING OIL TESTS BY CITIES SERVICE ENGINEERS!

at Timken-Detroit Axle Company

TOOL WEAR REDUCED 25%... MANUFACTURING COSTS ALSO CUT!

In an effort to reduce tool wear and cut manufacturing costs, the Wisconsin Division of Timken-Detroit Axle Company at Oshkosh called in Cities Service Engineers to make "on-the-job" tests.

Cities Service Lubrication Engineers made an on-the-spot study of the Timken-Detroit operation. This "on-the-job" evaluation by skilled Cities Service Engineers, long practiced in solving like problems, resulted in a recommendation for the use of a Chillo Cutting Oil that actually reduced tool wear 25% with proportionate savings in manufacturing costs!

WHAT ARE YOUR PROBLEMS? Why not take advantage of free, "on-the-job" testing? Call for our lubrication engineers at the office nearest you, or write Cities Service Oil Company, Dept. J-28, Sixty Wall Tower, New York City 5, New York.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

PRESENTING A GREAT NEW CONCEPT IN FORK LIFT TRUCK OPERATION...

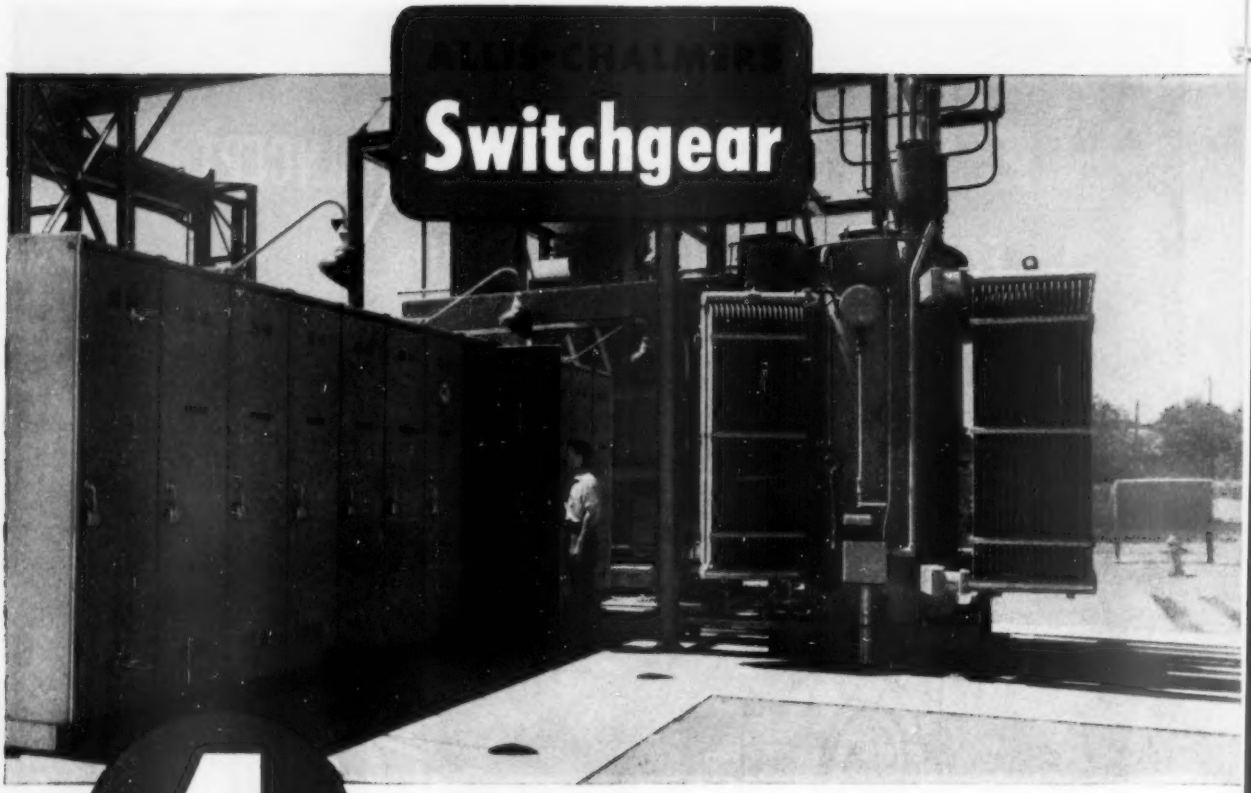
✔ HYDRAULICALLY CONTROLLED POWER
✔ NO GEAR SHIFTING OR CLUTCHING DELAYS
✔ EFFORTLESS DRIVER CONTROL

From the first name in Mass Handling Equipment comes the last word in torque drives for fork lift truck applications. Here is a product of intensive research and engineering, truly a trouble-free torque converter drive . . . available to match the capacity range of all Towmotor power plants. Here is the one drive that adds still more to superior Towmotor performance – For the complete story in a nutshell, send for book on TowmoTorque now.

Send for this FREE book now!

TOWMOTOR CORPORATION, Div. 510, 1226 E. 152nd St., Cleveland 10, Ohio

TOWMOTOR ENGINEERED FOR QUALITY PERFORMANCE



4 WAYS to Guard Against Power Interruption

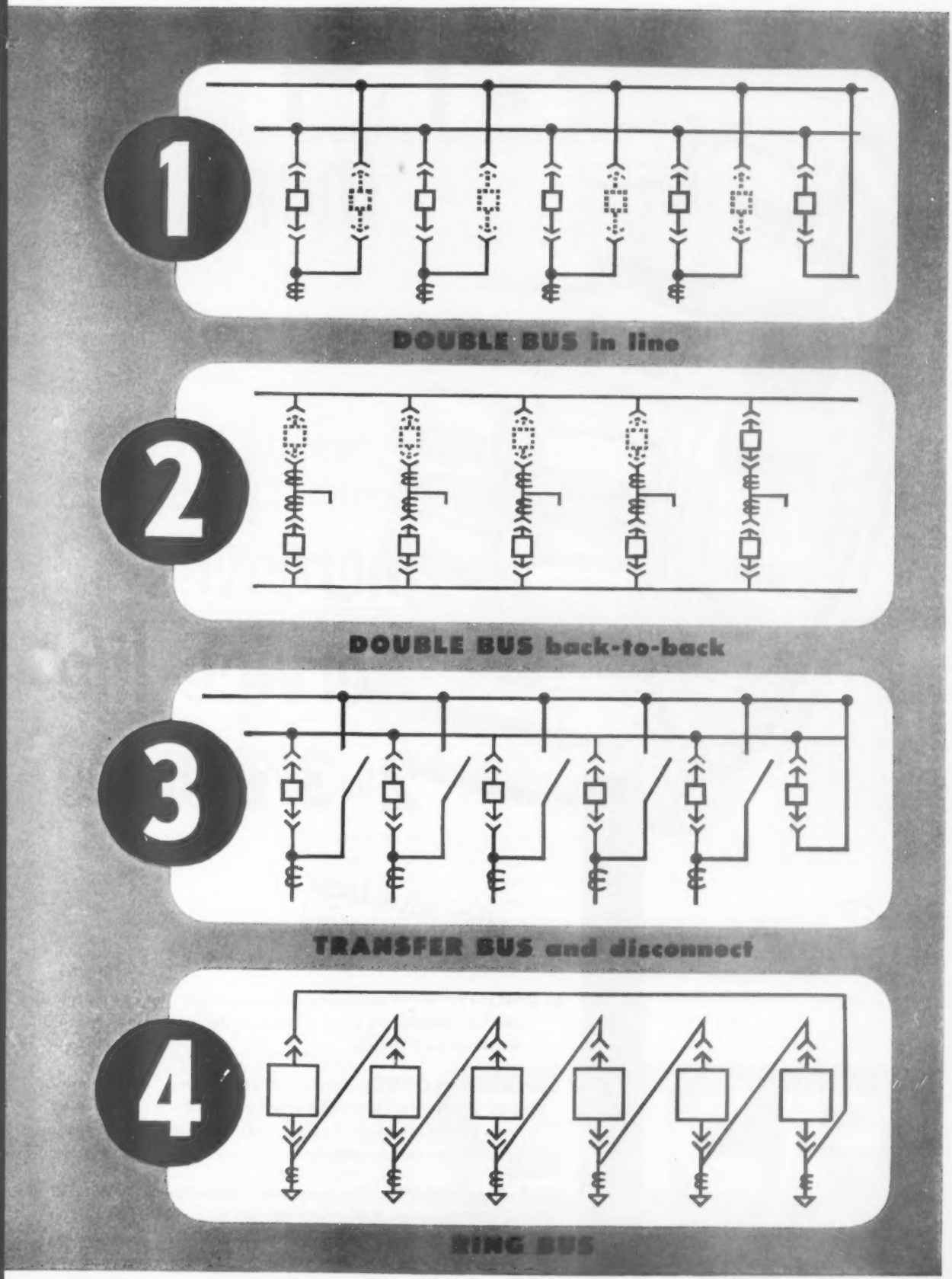
Here are a few of the many different circuit arrangements Allis-Chalmers can provide. All are designed to assure continuity of service. Each one is specially suited for specific situations.

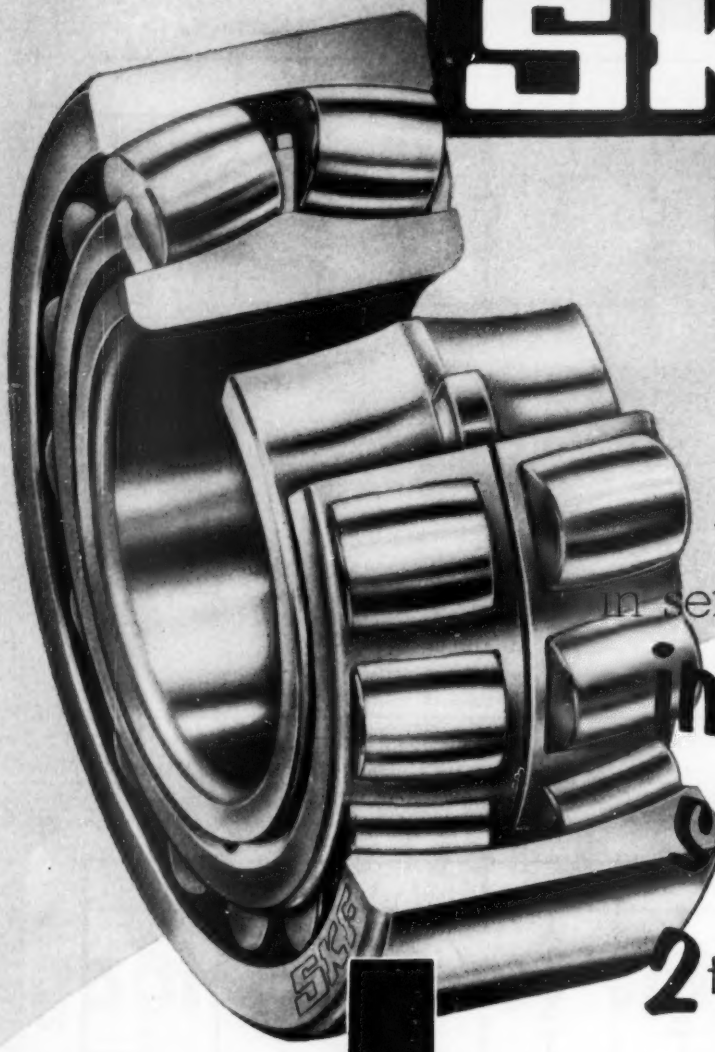
With Allis-Chalmers switchgear, all these circuit schemes have one advantage in common. Each arrangement shown can be built into standard units of Allis-Chalmers metal-clad switchgear without adding extra cubicles. This economy and simplicity, plus the obvious space savings, make Allis-Chalmers equipment especially attractive.

Which Arrangement is Best? A study of your problem is needed to answer this question. Any one of these arrangements may be best for your plant. Or maybe an entirely different scheme is needed. In any case, Allis-Chalmers engineers can help you work out the best scheme for you . . . one that provides ✓ economy, ✓ simplicity, ✓ space saving, and ✓ uninterrupted service.

For complete information, call your nearby A-C district office, or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-4135

ALLIS-CHALMERS A-C ALLIS-CHALMERS


1
DOUBLE BUS in line
2
DOUBLE BUS back-to-back
3
TRANSFER BUS and disconnect
4
RING BUS



SKF Increases

this improvement
in series 222 and 223
increases the
service life
2 to 3½ times

other advantages are important.

ECONOMY: When designing new equipment, the desired life can be obtained by using smaller or lighter bearings at considerable cost saving.

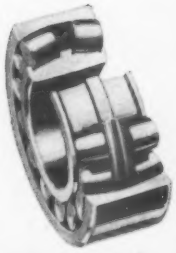
COMBINED LOADS: This great forward step in bearing design provides a Spherical Roller Bearing capable of carrying heavier combinations of radial and thrust loads or pure thrust loads of greater magnitude.

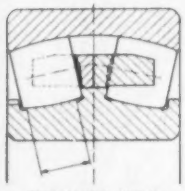
SELF-ALIGNMENT: The important self-aligning feature of SKF Spherical Roller Bearings has been preserved, so that considerable misalignment between the shaft and housing has no ill effect whatever on bearing capacity or life.

© 1953, SKF INDUSTRIES, INC.

capacity

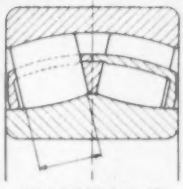
of spherical roller bearings 25% to 50% by means of improved internal design





BEARING 22315

This is the Spherical Roller Bearing design originated by SKF *more than 30 years ago.* The cross-section shows how the integral inner ring flanges, and the undercuts adjacent thereto, limit the effective length of the rollers.



BEARING 22315C

Here is the *latest* SKF improvement, a *revolutionary advance in design.* Effective roller guiding is accomplished by means of a separate ring. This eliminates the need for undercuts! This type of guide ring permits the rollers to take the position which their contact with the rings dictates. This assures uniform load distribution over the entire length of the longer rollers at all times. *Result*—greatly increased capacity and life.

SKF, the originator of the Spherical Roller Bearing, has, here again, provided Industry with another *first* through this improved design. During more than 4 years, thousands of installations have been made in railroad journals, vibrating screens, steel mill machinery and numerous other fields. Performance, in all cases, has been outstanding.

SKF Sales Engineers in our District Offices throughout the country will assist you in making use of the important advantages of the improved internal design of SKF Spherical Roller Bearings.

7428 A

This 12-page booklet gives you additional facts—sizes available—added capacity, size by size—increased life you can expect for each size—dimensional tabulations—and load and speed data. Write for your free copy of Bulletin 365-1 *now.*

SKF INDUSTRIES, INC., Dept. 616, Philadelphia 32, Pa., *manufacturers of* **SKF** *and* HESS-BRIGHT *bearings.*

SKF®

BALL AND ROLLER BEARINGS

STARTLING FACTS reveal really pays off

that Preventive Maintenance on V-Belt Drives

What is the *real* cost of replacing a set of V-Belts on a machine? Often it is far more than just the cost of the belts.

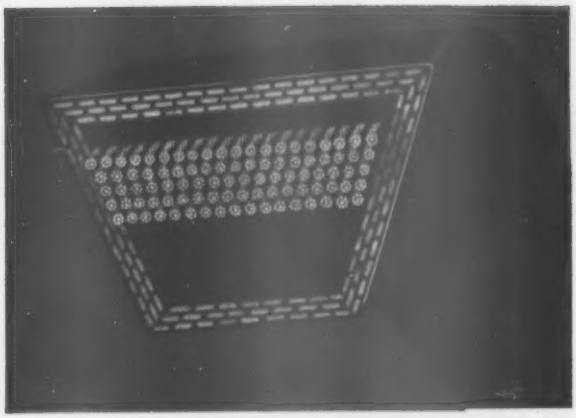
For example, a New Jersey plant has V-Belt drives on 25 air compressors. Each drive consists of three belts, and the belt life averages 2½ years. Just look at the breakdown of costs when a compressor has to be shut down for a belt change:

Cost of new belts	$ 6.03
Cost of installation labor	2.00
Cost of lost production during down time	500.00
Total cost of belt change	$508.03

Since this company operates 25 such air compressors, the total cost of changing V-Belts could reach $12,700.75 every 2½ years, or $5,080.25 per year.

On installations such as this, Preventive Maintenance on V-Belt drives really pays off. Dayton V-Belt Survey Experts often can extend the time period between belt changes by 50 per cent—through installing Dayton V-Belts. In this New Jersey plant, for instance, it would be possible to extend the time between changes to 3¾ years. This, in itself, is a worth-while saving. But the real pay off comes from the elimination of costly down time through Dayton's Preventive Maintenance Program.

You too will have drives where the overall cost of replacing belts is high. Consider the savings Dayton V-Belts and Preventive Maintenance offer you. Call your Dayton Jobber for further details, or write Dayton Rubber Company, Dayton 1, Ohio.



THOROBRED V-BELT

The Dayton Thorobred V-Belt is specially designed and built to transmit maximum horsepower where normal V-Belt service is involved. To impart high tensile strength and maintain great flexibility, the belt is constructed with continuous filament, high tenacity Rayon Cords whose surfaces are fully rubber coated by Dayton's new Thoro-Bonding process. To seal the inner structure, the belt is encased in a costly, all-weather "Hi-Twist" fabric cover impregnated with special rubber compounds for longer wear.

See "Belting" in the yellow pages of your local telephone directory for the name of your Dayton V-Belt Distributor. Let him cut costs on your V-Belt drives!

© D.R. 1953

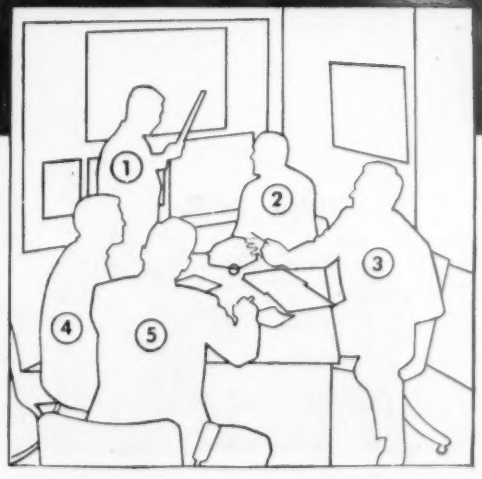
Dayton Rubber

Since 1905

World's Largest Manufacturer of V-Belts

DAYTON RUBBER COMPANY • DAYTON 1, OHIO

1. Westinghouse Application Engineer
2. Westinghouse Sales Engineer
3. Chief Engineer
4. Electrical Engineer
5. Production Superintendent



Your motor and control problems are local . . . so is Westinghouse application assistance

Do you put a full team on the field when you tackle a motor and control application problem? Are you cashing in on the know-how of your local staff of Westinghouse application engineers? Take a look at this line-up:

Your local Westinghouse sales engineer has a broad knowledge of all Westinghouse Motors and Controls. He knows their capabilities and limitations. He knows how to match motors and controls for maximum production.

Your local Westinghouse application engineer is equipped to analyze any motor and control problem and then develop the best solution. He can handle any application problem from a simple machine tool to a complete production line.

Your local Westinghouse product engineer is a specialist in one type of motor or control. These men work at the local level but operate from a manufacturing headquarters office.

Enlist the services of these men on your next motor and control application job. Call your local Westinghouse office for further details, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-21746

Application engineers work out of 126 Westinghouse offices

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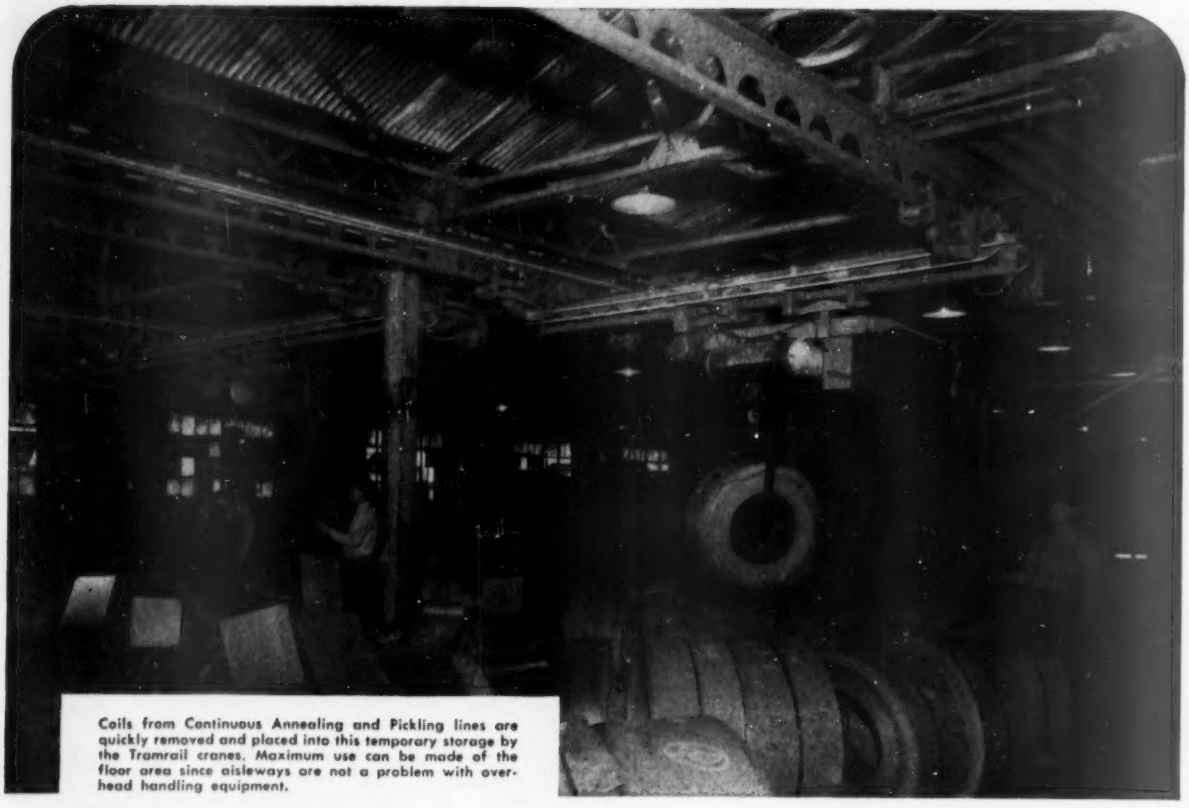
Albuquerque, N. M.	3-1826	Fresno 1, Cal.	4-5097	Providence 3, R. I.	GAspee 1-0818	Springfield 3, Mass.	6-8373
Allentown, Pa.	HEmlock 4-5108	Gary, Ind.	2-1468	Raleigh, N. C.	6302	Syracuse 4, N. Y.	2-1361
Amarillo, Texas	6-7838	Grand Rapids 2, Mich.	9-3106	Reading, Pa.	2-0287	Tacoma 2, Wash.	BRoadway 6565
Appleton, Wis.	4-4116	Greensboro, N. C.	2-3415	Richmond 19, Va.	2-4758	Tampa 1, Fla.	2-7246
Atlanta 2, Ga.	ATwood 1642	Greenville, S. C.	3-7755	Roanoke 4, Va.	6263	Toledo 4, Ohio	GArfield 4525
Augusta, Maine	3-4571	Hammond, Ind.	RUssell 8937	Rochester 7, N. Y.	MOnroe 1635	Trenton 10, N. J.	2-4136
Baltimore 2, Md.	PLaza 0300	Hartford 3, Conn.	5-0851	Rockford, Ill.	2-3452	Tulsa 3, Okla.	3-3191
Beaumont, Tex.	4-1481	Houston 2, Tex.	CHarter 4691	Rutland, Vt.	3292	Utica 1, N. Y.	4-1194
Binghamton 62, N. Y.	2-6403	Huntington 1, W. Va.	7146	Sacramento 14, Cal.	GIlbert 3-6525	Walla Walla, Wash.	5124
Birmingham 3, Ala.	53-2411	Indianapolis 9, Ind.	MArket 3301	Saginaw, Mich.	4-2640	Washington 6, D. C.	NAtional 8-8843
Bluefield, W. Va.	3-9131	Jackson, Mich.	2-0519	St. Louis 1, Mo.	CEntral 1120	Waterloo, Iowa	4679
Boston 10, Mass.	LIberty 2-0600	Jackson, Miss.	6-4839	Salt Lake City 1, Utah	5-3413	Watertown, N. Y.	1400
Bridgeport 8, Conn.	4-0151	Jacksonville 6, Fla.	78-6492	San Antonio 5, Tex.	GArfield 5114	Wheeling, W. Va.	6222-6223
Buffalo 3, N. Y.	WAshington 3966	Jamestown, N. Y.	8939	San Diego 1, Cal.	MAin 8151	Wichita 2, Kansas	5-2631
Butte, Mont.	2-2301	Johnstown, Pa.	81-257	San Francisco 8, Cal.	EXbrook 2-5353	Wilkes-Barre, Pa.	3-1144
Canton 2, Ohio	3-9171	Kansas City 6, Mo.	HArrison 7122	Seattle 4, Wash.	MAin 0808	Williamsport, Pa.	4289
Cedar Rapids, Ia.	7638	Kingsport, Tenn.	3769	Shreveport, La.	4-5298	Worcester 8, Mass.	4-2648
Charleston, S. C.	9904	Knoxville 8, Tenn.	2-8101	Sioux City 4, Iowa	5-7634	York, Pa.	7851
Charleston 1, W. Va.	37-565	Little Rock, Ark.	4-0367	South Bend 4, Ind.	3-7167	Youngstown 3, Ohio	4-1118
Charlotte 1, N. C.	5-3731	Los Angeles 17, Cal.	MAdison 6-3881				
Chattanooga 2, Tenn.	7-4361	Louisville 2, Ky.	CLay 0212				
Chicago 54, Ill.	WHitehall 4-3860	Madison 3, Wis.	5-4868				
Cincinnati 2, Ohio	GArfield 2250	Medford, Ore.	2-8289				
Cleveland 13, Ohio	CHerry 1-7600	Memphis 3, Tenn.	8-8546				
Columbia, S. C.	3-8823	Miami 4, Fla.	2-1553				
Columbus 15, Ohio	MAin 5527	Milwaukee 2, Wis.	DAly 8-1800				
Corpus Christi, Tex.	3-9237	Minneapolis 13, Minn.	GRanville 3545				
Dallas 1, Tex.	RIverside 5231	Mobile, Ala.	8-5443				
Davenport, Ia.	3-2761	Nashville 3, Tenn.	42-3505				
Dayton 2, Ohio	ADams 9153	Newark 2, N. J.	MArket 2-0200				
Denver 2, Colo.	KEystone 8121	New Haven 10, Conn.	5-3191				
Des Moines 8, Iowa	2-0244	New Orleans 13, La.	RAymond 8656				
Detroit 31, Mich.	TRinity 2-7010	New York 5, N. Y.	WHitehall 3-4321				
Duluth 2, Minn.	7-1541	Niagara Falls, N. Y.	9700				
El Paso, Tex.	2-5691	Norfolk 10, Va.	5-1639				
Emeryville 8, Cal.	OLympic 2-3770	Oklahoma City 2, Okla.	REgent 6-1633				
Erie, Pa.	24-867	Omaha 2, Nebr.	HArney 8700				
Evansville 8, Ind.	5-7146	Peoria 3, Ill.	2-5439				
Fairmont, W. Va.	501	Philadelphia 4, Pa.	EVergreen 2-1200				
Fergus Falls, Minn.	4250	Phoenix, Ariz.	4-3158				

YOU CAN BE SURE...IF IT'S Westinghouse

Tramrail Cranes BOOST Strip Production

Speed Handling—Cut "Down Time"—Aid Safety



Coils from Continuous Annealing and Pickling lines are quickly removed and placed into this temporary storage by the Tramrail cranes. Maximum use can be made of the floor area since aisleways are not a problem with overhead handling equipment.

AS a leading producer of high quality alloy strip steels, mostly of light gauge, the Superior Steel Corp., Carnegie, Pa. has secured definite production advantages and greatly improved overall plant efficiency through abundant use of Cleveland Tramrail cranes.

As the work is primarily that of rolling, annealing, pickling and handling, to obtain maximum production from their equipment, it is necessary to keep it in operation as many minutes out of the day as possible. This means that there be no delays in handling the coils of strip to and from the mills. It also means that the mill rolls must be changed in the least possible time. The Tramrail cranes have proven of great success in fulfilling these requirements and reducing "down time" to a minimum.

They have also proven to be a great aid to the workers' welfare. Being fully motorized, they have practically eliminated all manual lifting and moving. As a result, worker fatigue has been reduced and safety improved.

GET THIS BOOK!

BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy

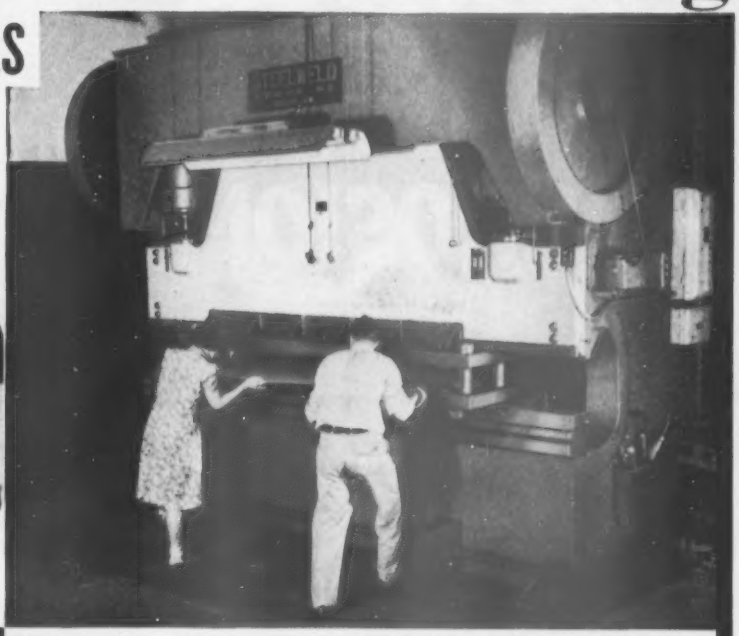
CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
3283 EAST 284TH ST. WICKLIFFE, OHIO.

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

blanking and embossing

ACOUSTIMETAL PANELS

4800 panels for 12" x 24" sound-deadening cells are blanked out and embossed per 8-hour day with these dies.



This rugged smooth-working press performs nearly every kind of metal forming operation at Dussing & Hunt, Inc.—bending, forming, flanging, blanking, embossing, and punching. It is easy to change the dies from one job to another or repeat previous runs of work to close tolerances.

Of the many types of work performed on the Model J4½-10 Steelweld Press at Dussing & Hunt, Inc., Buffalo, N. Y., the blanking and embossing of panels for Acoustimetal sound-deadening cells is one of the most interesting.

Large sheets of 26 gauge perforated metal are fed into the dies attached to the bed and ram, by the man operator and his woman assistant. At each stroke of the ram three panels are blanked out and embossed. Six panels for 12" x 24" cells are made from each sheet. 100 sheets are passed through the press per hour. Thus, 600 panels are turned out per hour, or 4800 per eight-hour day.

A large variety of metal parts are produced on the Steelweld. Included are 22-gauge stainless steel tops for deep-freeze cabinets with neatly rounded flanges, fire-proof doors and all-steel industrial doors of 10 to 14 gauge, 14-gauge pressed steel frames, heavy steel channels and many other parts.

The press was installed in 1942 and has been kept going continuously. The Plant Manager of this rapid-growing concern says, "It has proved very satisfactory and efficient."

Acoustimetal panels are produced with such speed that one man is kept busy at the rear of the press removing the scrap and a woman is fully occupied stacking the panels as they roll down the conveyor from the press bed.

GET THIS BOOK!

CATALOG No. 2010 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.

3231 EAST 281st STREET, WICKLIFFE, OHIO

STEELWELD

BENDING PRESSES

BRAKING • FORMING • BLANKING • DRAWING • CORRUGATING • PUNCHING

NO-OX-ID PREVENTS CORROSION IN PRODUCTION, SHIPMENT AND STORAGE

CONVEYOR SYSTEM moves products to be protected through bath of NO-OX-ID. Movable double tank permits flexibility in applying either of two NO-OX-ID consistencies.

Corrosion is a constant threat to the metal products you manufacture.

Corrosion can be simply and inexpensively prevented with Dearborn NO-OX-IDs. There are NO-OX-IDs that protect metal surfaces during the various stages of production . . . NO-OX-IDs that protect during shipment . . . NO-OX-IDs for long or short periods of storage.

Your Dearborn Sales Engineer is prepared to demonstrate how to protect your products by recommending the proper NO-OX-ID and the method of application best suited to your operation. Write for bulletin on NO-OX-ID Rust Preventives.

HOT DIP METHOD of applying NO-OX-ID provides maximum protection to small finished parts.

COLD SPRAY METHOD. Bearing races are protected against corrosion or staining by cold spray of NO-OX-ID Rust Preventive.

Dearborn
TRADE MARK

DEARBORN CHEMICAL COMPANY
MERCHANDISE MART PLAZA
CHICAGO 54, ILLINOIS

THE ORIGINAL RUST PREVENTIVE

NO-OX-ID

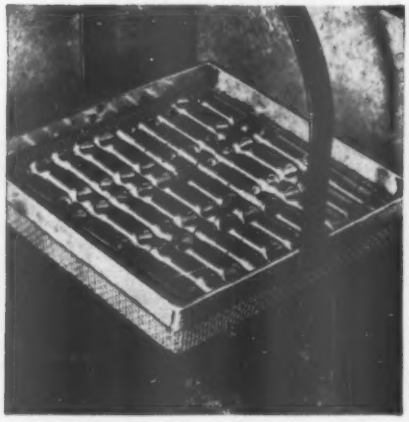
Dearborn knows the answers to EXPORT PACKAGING PROBLEMS

Products that must be packaged for export call for thorough protection.

Dearborn supplies effective NO-OX-ID consistencies and government specification materials for fingerprint removal, rust prevention, wrapping and sealing.

Your Dearborn Sales Engineer will assist you in planning your complete export packaging procedure. Call him or send for your copy of Bulletin 3025—"Preventing Corrosion in Export Packaging"—which describes and illustrates approved Export Packaging techniques.

Package sealed with Dearborn's dip seal coating—a transparent wax type which meets government specifications.



To prevent the formation of fingerprint stains, parts are immersed in Dearborn fingerprint removal agent.

Conforming Wrap. An effective means of packaging small parts with NO-OX-IDs, NO-OX-IDized Wrappers—dip seal coating.

Dip sealing the wrapped carton provides the final protective barrier. Consult with your Dearborn Sales Engineer.

Mail the Coupon

Dearborn Chemical Company, Dept. F
Merchandise Mart Plaza, Chicago 54, Illinois

Please send me:

- ☐ Bulletin on NO-OX-ID Rust Preventives
- ☐ Bulletin 3025
- ☐ Have a Dearborn Sales Engineer call.

Name.....

Title.....

Company.....

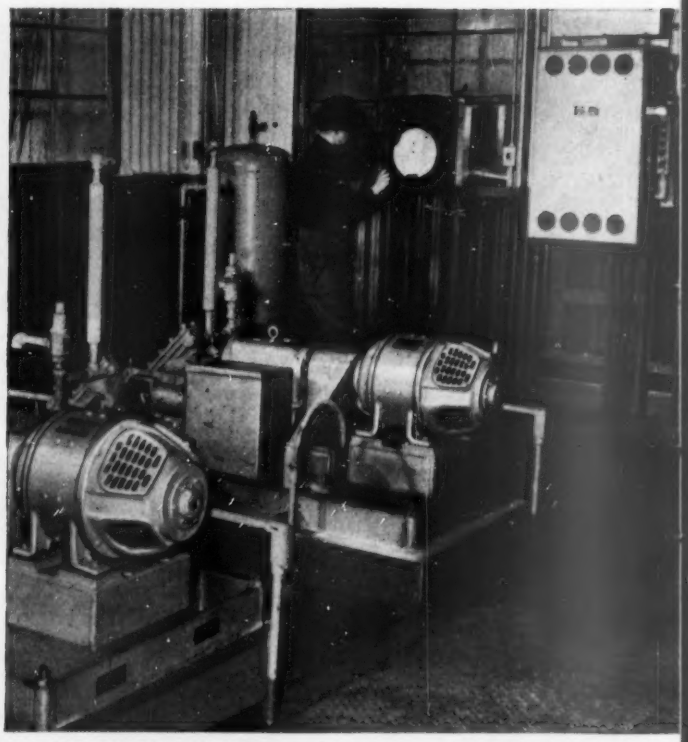
Address.....

City.....*State*.....

CONTROL SENSITIVITY of the G-E Speed Variator at the Jefferson Mill Inc., Jefferson, Ga., helps cut costs by enabling the operator to speed up the splicing of the cloth rolls . . . enables him to easily control processing speed for any type of cloth. The Speed Variator is a packaged unit . . . easily installed in any convenient location . . . provides your machine with stepless speed control up to a 40 to 1 ratio.

Cut Costs by modernizing your machines

G-E ACA MOTORS now control coal stokers at the Socony-Vacuum Oil Co., Inc., Olean, N. Y. Working directly from AC current the ACA motor offers low cost, low range stepless speed adjustment.



G-E THY-MO-TROL DRIVE accurately controls chemical proportioning pumps at Fibreboard Products, Inc. East Antioch, Calif. This electronic drive offers precise control in speed ranges up to 100 to 1.

G-E SPEED VARIATORS at the Ohio Boxboard Co., Rittman, Ohio, centralize control of various stock preparation processes . . . guard stock thickener speeds. Here you see three of the Speed Variator units—foreground . . . Available in ratings from 1 to 200 hp the versatile G-E Speed Variator can be adapted for even closer speed regulation by the addition of an amplidyne or electronic regulator.

with a G-E Adjustable-Speed Drive!

Here are four manufacturers who have effectively improved one or more of the manufacturing operations in their plants by modernizing their equipment with G-E Adjustable-Speed Drives.

In the same way the proper application of adjustable speed can minimize waste and increase production for you. In addition, adjustable speed by making your present equipment more flexible, will enable you to manufacture a greater variety of goods.

G-E Adjustable-Speed Drives give you economical speed regulation as close as 1% if necessary . . . assure you of correct stepless speed adjustment. Standard drives are available in ratings from 1/40 to 200 hp with speed ranges from 3 to 1 up to 100 to 1.

For full information consult your nearest General Electric Apparatus Sales Office. Your G-E Sales representative will be glad to recommend the most economical drive best suited to your operation. For printed information on the complete line of Adjustable-Speed Drives, use the coupon.

You can put your confidence in—

GENERAL ELECTRIC

LET G.E. HELP YOU PICK THE RIGHT DRIVE

Because only General Electric makes all major types of electric adjustable-speed drives, it is best qualified to help you select the right drive. Send for these informative bulletins.

☐ **A.** This 26-page manual describes all four types of drives and where to apply them. Bulletin GEA-5334.

☐ **B.** Lower cost, simplest a-c drive. Bulletin GEA-4883.

☐ **C.** More flexibility, moderate cost. Bulletin GEA-5335.

☐ **D.** Top performance, 1/40—30 hp. Bulletin GEA-5337.

☐ **E.** Top performance, 1–200 hp. Bulletin GEA-5336.

General Electric Company
Section D 646-24
Schenectady 5, N. Y.

Please send me the bulletins checked
☐ for reference only
☐ for planning an immediate project

NAME .....

COMPANY .....

ADDRESS .....

CITY ..... STATE .....

HYATT BEARINGS DIVISION, GENERAL MOTORS CORPORATION

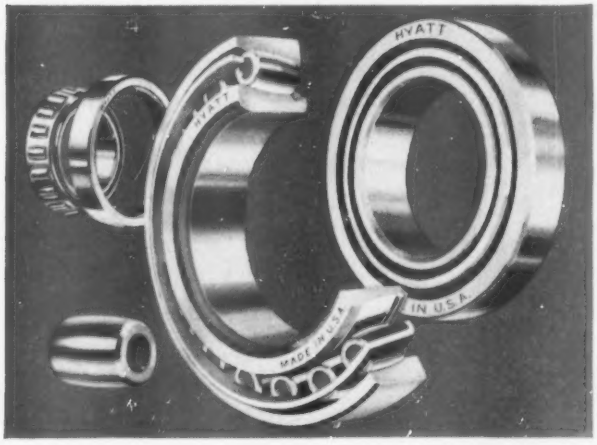
HYATT BARREL BEARING

now available in volume!

Hyatt is rolling out the barrels! . . . and a familiar shape is giving a big lift to modern industry! A new Barrel Bearing —pioneered and perfected by Hyatt—is available in volume for the first time! There's no other bearing quite like it—and it's ready for a starring role in industrial production!

The Barrel name comes from the barrel shape of the rollers . . . but its superiority in bearing applications comes from *dual-purpose design* and *self-aligning ability!* This unique bearing takes load from any direction . . . and operates at full load-carrying capacity under conditions of misalignment! And in addition, the barrel shape of the rollers combines the low rolling friction of a ball with the high load capacity of a cylindrical roller—so that the Barrel Bearing is ideal for a wide range of applications.

Expensive? *Not at all!* Advanced manufacturing processes —plus the facilities of one of the newest and finest bearing plants in the world—make the initial cost far lower than you would expect! . . . For full information on this newest solution to the friction problem, write to the address below.



Self-aligning action makes the Barrel Bearing ideal for tractors and farm implements. Over many years, its durable, dependable performance has been established in a wide range of these applications.

In trucks and construction equipment, too, Hyatt's Barrel Bearing operates with full efficiency under conditions of heavy, multiple-direction loading. Unique roller and race design distributes the load over large areas of contact.

Hyatt's new plant, in Clark Township, N. J., is among the most modern in the world. New equipment makes possible advanced manufacturing processes, and research facilities are the finest in the bearing industry.

YATT ROLLER BEARINGS

HARRISON, NEW JERSEY

AND NOW-

Out of the Great Comes the *NEW*

With the advanced Diamond "Z" Grid, Gould makes another contribution to storage battery perfection! Here is the most recent achievement of the famous Gould Laboratory . . . one more example of Gould progress through *continuous* battery research.

New research developments make it possible to combine the design advantages of the original Diamond grid and the "Z" grid. The Diamond "Z" gives you the structural design of diamond bracing and overall mechanical strength, and still retains the uniform density of grid members so well achieved in the "Z" design.

This advance could only cóme from Gould . . . for only Gould has the experience with both the Diamond grid and the "Z" grid. The Diamond "Z" grid is another step forward in Gould's research program to give you extra battery performance, longer battery life. When you buy, buy Gould!

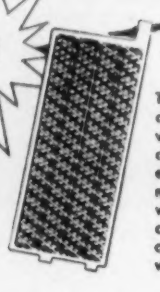
HERE'S WHAT YOU GET:

1. A grid built to the demands of users with top performance and long life.
2. A grid that has been tested under rugged operating conditions . . . tough day in and day out service.
3. A grid built to meet tomorrow's needs but available today . . . years ahead of requirements.
4. A grid that cannot "grow" under the toughest kind of treatment . . . with that extra measure of strength for every application.
5. A grid that is built with diamond bridge-like construction . . . with extra strong members to withstand abuse.
6. A grid that delivers the rugged service that future demands will require . . . demonstrated in every conceivable test for long, dependable operation.

Write for the new Catalog featuring this amazing grid that delivers more for your money

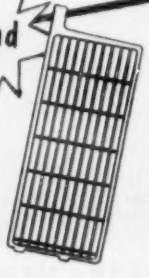
TODAY THE DIAMOND BATTERIES

1st THE DIAMOND GRID



This basic grid design was advanced for its day, highly efficient. For many years, it was the standard by which other batteries were judged.

2nd THE "Z" GRID



Here was a tremendous advance in battery design. Intensive Gould research produced an improved casting method, which for the first time made possible larger, longer-life grid members.

GOULD

GOULD-NATIONAL

Visit us at the National Industrial Packaging and Materials Handling Exposition, Boston, October 20 to 22, Booth 317.

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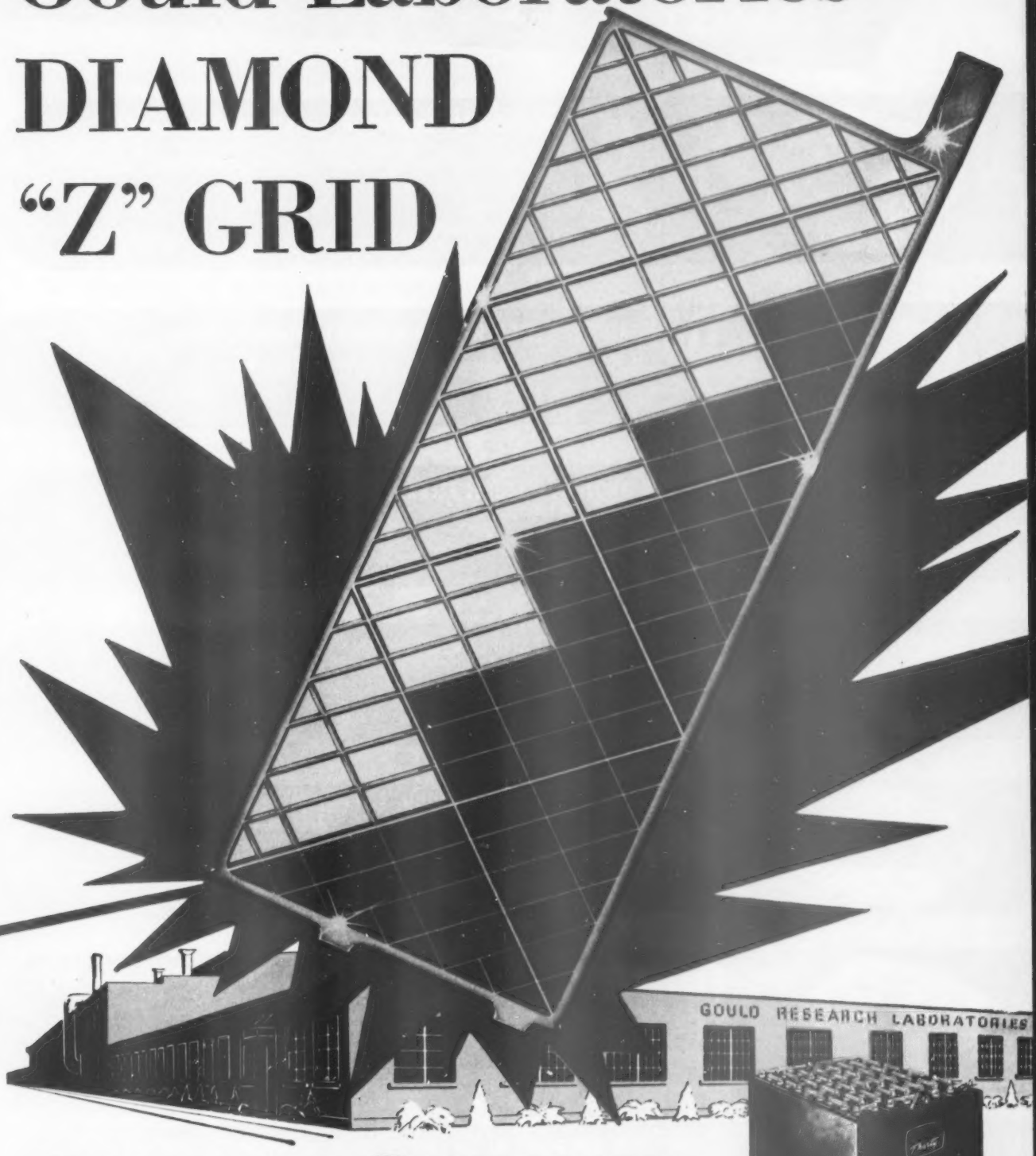
Gould Laboratories DIAMOND "Z" GRID



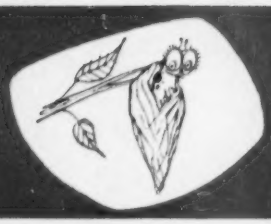
INDUSTRIAL BATTERIES

BATTERIES, INC., Trenton 7, New Jersey

Always Use Gould-National Automobile and Truck Batteries

Specify
The GOULD "THIRTY"
Now, more than ever, America's Finest Industrial Truck Battery!

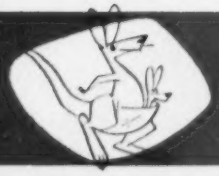
ONLY HY-TEST GIVES YOU THESE



1

DUPONT DACRON STITCHING FOR ALL-ROUND RESISTANCE!

Now HY-TEST adds another "longer-wear" feature . . . tough, durable DACRON stitching. Incredibly stout . . . amazingly resistant to acids, alkalis, bleaches, common solvents, mildew, bacterial action, moisture and perspiration. DuPont's DACRON polyester fibre in *all* Neoprene sole shoes!



2

ANOTHER LONGER WEAR FEATURE! NEOPRENE HEELS!

DuPont's Neoprene Heels on *all* leather sole shoes! For longer, tougher wear! Resists heat . . . oils and grease . . . and abrasive wear. Neoprene wears like iron . . . even when tested on foundry floors.

3

ANOTHER FEATURE! RELAXING NEW "ARCH-EZE"!

An amazing comfort feature that makes walking a pleasure. Less jolt! Less shock! Perfect comfort for the foot and arch that cuts work-fatigue materially!

4

ANOTHER FEATURE! HEAT RESISTANT SOLE FOR HOT MILL WORK!

An exclusive new construction that insulates the foot from heat without sacrificing longer wear. Unique midsole protects from heat. Tough, durable Neoprene outsole for longer wear.

5

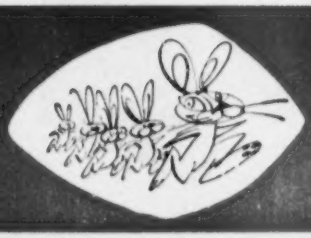
ANOTHER FEATURE! TOUGH, FLEXIBLE BOL TAN INSOLE!

Durable Bol Tan virtually eliminates perspiration damage to the insole. Stays soft and pliable months longer . . . even under the most grueling conditions. Twice the wear in every pair! A *new pair and money refunded* if Bol Tan deteriorates from perspiration conditions.

6

ANOTHER FEATURE! TOUGH, BUT GENTLE ISCONAP ONE-PIECE LINING!

One-piece nap lining that won't come loose . . . bunch up to cause blisters . . . or rub skin raw. Permits the active foot to breathe! Retards perspiration rot and mildew. Shoes retain their good looks longer . . . wear better!



7

THE LONGEST LINE OF SAFETY SHOES IN AMERICAN INDUSTRY!

A shoe to fit every job . . . every foot . . . every personal desire, because HY-TEST is the most complete line of safety shoes in American industry! Heat resistant shoes, oil-resistant oxfords, shoes and boots, exclusive Anchor-Flange and Anchor-Flange Winguard austempered steel toes . . . you choose them *all* from one complete line when you choose HY-TEST.

7 OUTSTANDING FEATURES IN SAFETY SHOES!

FEATURE FOR FEATURE
VALUE FOR VALUE
YEAR AFTER YEAR . . .

HY-TEST PIONEERS THE WAY TO GREATER FOOT SAFETY IN AMERICAN INDUSTRY

• DACRON • BOL TAN • NEOPRENE
• ISCONAP • ANCHOR FLANGE

Time after time . . . HY-TEST has the features that make safety-shoe history. Repeatedly, HY-TEST adds the tremendous new *exclusive* features that have made it *the most complete . . . the most purchased* safety shoe in industry. This is shoe-making at its best! The best leathers, the most advanced techniques, the most skilled craftsmen! All combined in America's outstanding safety shoe . . . HY-TEST! Nowhere else . . . absolutely *nowhere* . . . can you find the same skill and quality, or the exclusive features you find in *one line* when you look to HY-TEST. If safety shoes were *custom-made*, you still couldn't beat these HY-TEST quality features. Regardless of style . . . of sizes . . . of special features, HY-TEST has everything the worker *needs!* And has it the way he *wants* it! So . . . now! In your plant . . . look to the safety shoe *proven by popularity and sales!* Look to HY-TEST! Write today for your free catalog . . . or visit us at Booth 95 in Chicago . . . October 19 thru 23rd.

ORDER BY TELETYPE
Fast, Immediate Delivery!
Philadelphia . . . . . PH 476
St. Louis . . . . . SL 300

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HY-TEST SAFETY SHOES

Insure Workers' Feet in Sure Protection

HY-TEST INTERNATIONAL SHOE COMPANY SAFETY SHOES

THE WORLD'S LARGEST SELLING SAFETY SHOE

DIVISION OF INTERNATIONAL SHOE COMPANY

ST. LOUIS 2, MISSOURI

940 NORTH BODINE STREET, PHILADELPHIA, PA

1878 75 1953
YEARS OF ELECTRICAL PROGRESS

ONE OF FIVE 2000-HP G-E SYNCHRONOUS MOTORS USED FOR AIR-COMPRESSOR DRIVES AT FORD MOTOR CO., ROUGE PLANT.

FOUR REASONS WHY G-E SYNCHRONOUS MOTORS

1. STRONG, FABRICATED FRAMES . . .

The welded steel-plate stator frame provides maximum rigidity in a comparatively lightweight construction. The sturdy channel-shaped frame consists of a wrapper plate firmly secured by continuous welds to rigid side plates. This design, proved by years of operating experience, affords more than ample strength for clamping and supporting the stator core.

2. G-E BRUSHES ON G-E MOTORS . . .

Brushes on G-E synchronous motors are a product of G-E teamwork. Close co-operation between machine designers and laboratory engineers means you get the right brush on the right motor for your particular application. In addition to extensive research and testing, all new and improved grades of brushes are thoroughly field-tested before approved for standard use.

Dependable G-E Synchronous Motors on 24-Hour Assembly-line Service

Ford Motor Company uses G-E synchronous motors for air-compressor drives

Compressor-motor dependability is really put to test on 'round-the-clock service at Ford Motor Company's Rouge plant. Compressed air is used 24 hours a day on many assembly operations, and a dependable supply is vital to keep production lines moving.

To furnish this all-important air, five 2000-hp G-E synchronous motors drive reciprocating compressors continuously—with only slight reductions in demand on certain shifts.

G-E synchronous motors can be relied upon for such continuous service with minimum downtime. You can depend on them because in back of every G-E synchronous motor stand more than half a century of motor engineering leadership . . . superior research and testing facilities to assure excellent component materials . . . and a corps of experienced craftsmen who are proud of the equipment they build—and build it to last.

The next time you consider a drive for heavy, continuous-service equipment be sure to call in your G-E representative to discuss any special application problem you may have. Have him explain the many money-saving uses for G-E synchronous motors and point out their operating economies.

In the meantime, you can obtain more information on G-E synchronous motors by writing for these publications: GEA-5332, "Low-speed Synchronous Motors," or GEA-5426, "High-speed Synchronous Motors." Write to Section 770-29, General Electric Co., Schenectady 5, N. Y.

You can put your confidence in—

GENERAL ELECTRIC

GIVE LONG, DEPENDABLE SERVICE . . .

3. LONG INSULATION LIFE . . .

Insulating materials, manufactured in our own factories by the most modern methods, conform to rigid G-E specifications and are applied by experienced operators, above. Thus coils are uniform, interchangeable, mechanically rugged, and moisture resisting.

4. LOW-RESISTANCE CONNECTIONS . . .

For dependable operation, stator windings are silver brazed, as shown above. Joints of this type have low electrical resistance, exceptional thermal and mechanical strength. These important properties are difficult to obtain by other methods.

The new B9 is as fast-cutting as they make 'em. Adaptable to speeds up to 16,000 surface feet per minute, the new Norton B9 cut-off wheel is a real production booster. Resinoid bonded and available with either smooth sides, or with the rougher "F" sides for greater chip clearance, it's a cool-cutting, non-burning performer on all types of metals.

Add the "TOUCH of GOLD" to all your cut-off jobs

Your cutting-off jobs may involve ferrous or non-ferrous metals of any degree of hardness — or non-metals ranging from rubber hose to marble. Your machines may be high speed or low speed — swing frame, chopper, traverse, floor stand or portable. The point to remember is:

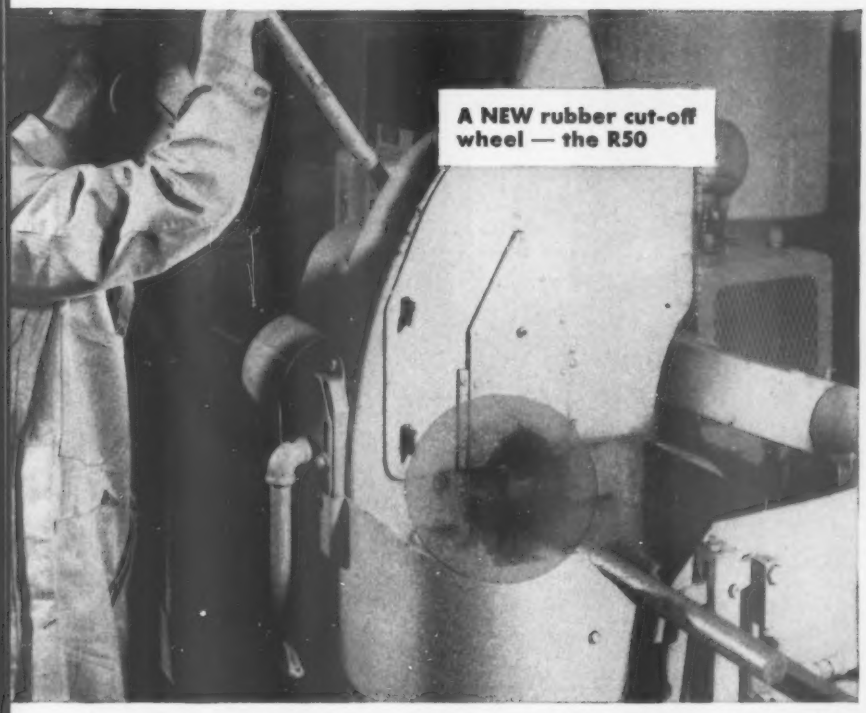
With the right Norton cut-off wheel you're sure of the fast, safe, clean-cutting performance that adds the profit-boosting "Touch of Gold" to every job.

Norton cut-off wheels are made with resinoid, rubber and shellac bonds, in ALUNDUM* (aluminum oxide) abrasive and CRYSTOLON* (silicon carbide) abrasive, and in a complete range of sizes. Whatever its type, you can count on every Norton cut-off wheel for the easy handling and exceptional breakage-resistance that mean happier operators and higher production.

Your Norton distributor will be glad to recommend the *right* cut-off wheels for your jobs. Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your phone directory yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

NORTON
ABRASIVES
Making better products... to make other products better

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries



The new R50 has built-in chip clearance. Designed primarily for wet-cutting of metal bar stock, this new Norton rubber bonded cut-off wheel handles diameters up to 2½" on chopper machines and up to 6" on oscillating machines. Built-in chip clearance, unusual in this type of wheel, is one of the reasons why the R50 cuts freer and cooler, without case hardening the ends of the stock.

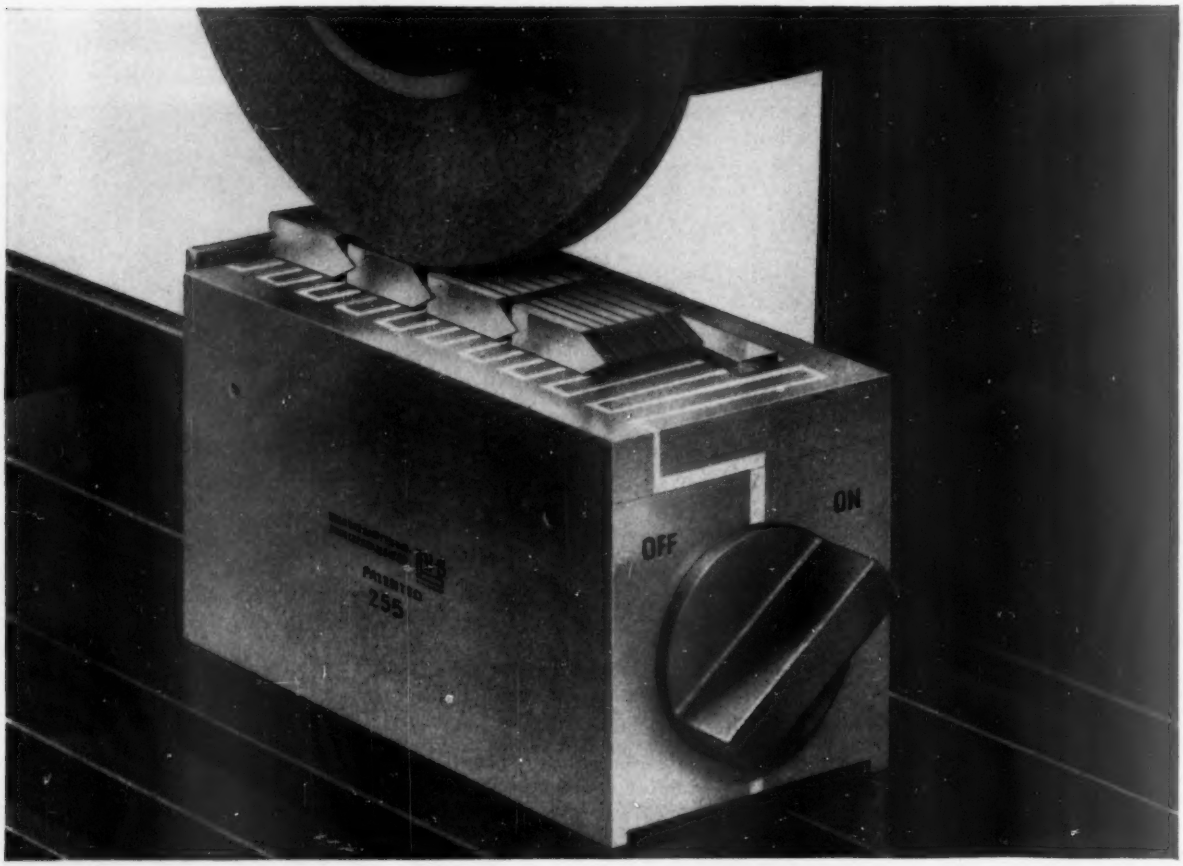
The BN covers a wide job-range. You can't beat the long popular Norton BN wheel for general, all-around usefulness. Or for safety either, because the strong reinforcement of this resinoid bonded wheel practically eliminates breakage from the cutting-off picture. Uses include: notching, slotting and cutting-off gates and risers from non-ferrous castings; cutting wire rope; slotting railway track welds; tuck pointing; cutting non-metallic materials such as fibre board, concrete, tile, plastics, and the like.

The B2 is versatile. Handy as a general purpose cut-off wheel for the tool room, the Norton resinoid bonded B2 is also used for lighter jobs on plastics, marble, carbon brake lining and other non-metals.

The R30 is standard. The bond used in the Norton R30 is the standard rubber bond for smaller wheels and is preferred for jobs such as cutting-off thin tubing, small diameter work and fine slotting.

The R20 is rugged. A very durable wheel, the Norton R20 has the strongest of rubber bonds. An ideal wheel for dry-cutting of metal rods and other jobs where dressing action is particularly severe.

W—1520



Dependable holding for a variety of uses

Permanent Magnet Chucks . . . Rectangular and Rotary

A POWERFUL MAGNETIC GRIP holds work securely on Brown & Sharpe Permanent Magnet Chucks. No electric current is used . . . no danger of short-circuited wires or heating. Turn of control handle engages or releases magnetic holding power. Completely self-contained and portable for use throughout the shop.

Rectangular Models in 8 sizes from 2 7/16" x 5 1/4" to 12 1/8" x 36"; Rotary Models in 5", 7" and 9" diameters.

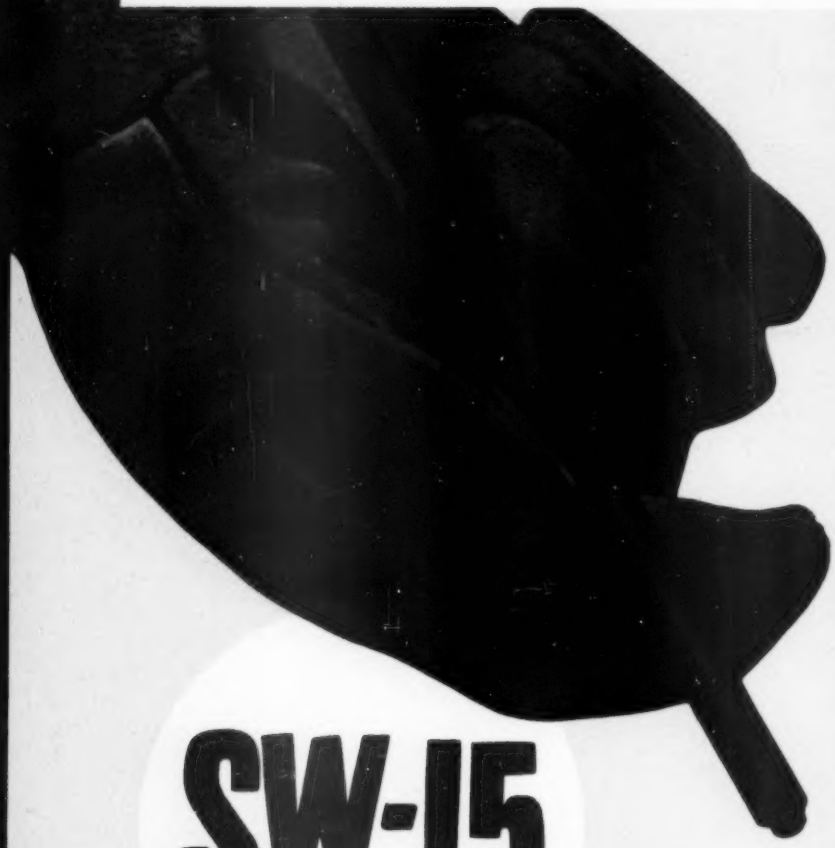
For sale only in the United States of America and its territories. Write for Catalog. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

BUY THROUGH YOUR LOCAL DISTRIBUTOR

Brown & Sharpe B·S

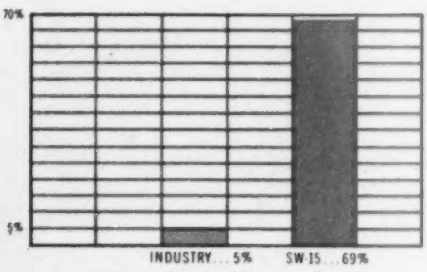
more manufacturers are using SW-15 electrodes than ever before!

more manufacturers are using SW-15 electrodes than ever before!



SW-15

the UNIVERSAL Electrode

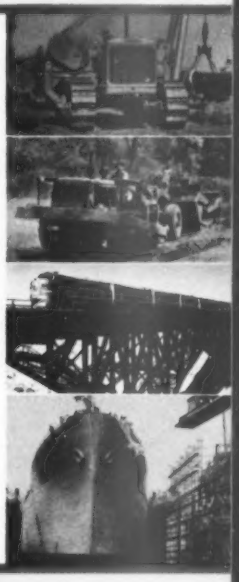


Here is the evidence of SW-15's growing acceptance among manufacturers who depend on welding in the fabrication of their products. SW-15 showed a 69% increase in acceptance and use, as compared with but 5% for all electrodes produced by the welding electrode industry from 1950 through 1952.

A few of the principal users of SW-15 are:

J. D. Adams
Allis-Chalmers
E. W. Bliss
Caterpillar
Chicago Bridge & Iron
Fruehauf Trailer
Graver Tank & Mfg. Co.
The Heil Company
Illinois Central Railroad
Ingersoll Rand
Iowa Iron & Steel
Kansas City Structural Steel
Link Belt Speeder
Omaha Steel
Pullman Standard Car
Santa Fe Railroad
Sheffield Steel
Tracksen Company

Others are joining these every month to share the many benefits which the SW-15 electrode provides their welding operations.



SW-15 was developed as a universal type electrode which could be used for an extremely large number of welding applications. There is nothing else like it among mild steel welding electrodes!

It performed its first welding job in 1939, when it was taken into the field to weld refractory towers and sustaining structures usually welded with an E6010 electrode. It bettered the standard welding time by 50%! Its unusual ease of manipulation won over welding operators and management at once. New operators were readily trained with the SW-15. Its x-ray quality set new inspection records.

Two years later, SW-15 was welding on E6012 applications in the farm machinery and heavy road equipment fields. Excellent weld appearance, easy slag removal, little spatter, good bead with no undercut helped improve the products of these manufacturers.

Manufacturers found that due to SW-15's ease of manipulation, operators avoided slag inclusions, fish-eyes and voids, even in welds made in the field. This greatly improved the appearance of products it was used on and enhanced the reputation of the SW-15 electrode.

SW-15 is just one of the welding electrodes in the A. O. Smith line. There's an A. O. Smith electrode for every welding requirement:

MILD STEEL		HIGH TENSILE		LOW HYDROGEN		STAINLESS		STAINLESS	
AWS Class	A. O. Smith	AWS Class	A. O. Smith	AWS Class	A. O. Smith	AISI Class	A. O. Smith	AISI Class	A. O. Smith
E6010	SW-10	E7010	SW-75	E6016	SW-64	502	SW-151	310	SW-359
E6011	SW-14	E7010	SW-80	E6016	SW-65	505	SW-152	310	SW-169
E6012	SW-11	E7020	SW-76	E7016	SW-84	410	SW-153	310	SW-168
E6012	SW-17	E8013	SW-86	E8016	SW-81	430	SW-154	310	SW-368
E6013	SW-15	E9010	SW-95	E9016	SW-90	308	SW-162	316	SW-160
E6013	SW-16	E9013	SW-87	E9016	SW-89	308	SW-362	317	SW-161
E6020	SW-35	E10013	SW-88	E10016	SW-100	309	SW-166	318	SW-158
		E10020	SW-101	E12015	SW-120	309	SW-167	347	SW-157
				E12016	SW-103	310	SW-159	347	SW-357

THE ONE MILD STEEL ELECTRODE

no other can match!

...in ease of handling

SW-15 is easy for operators of varying skills to use in all positions. Its smoother arc, self-cleaning slag, lack of spatter and freedom from undercutting makes it easy for anyone to produce good looking, sound welds with the least effort!

...in quality of weldments

SW-15 welds have high-strength, high-yield, good ductility and consistent x-ray quality. This extends its use to welding low alloy, high tensile steels such as corten and manten, impossible for electrodes whose physicals can't compete with those found consistently in SW-15 welds.

...in appearance of welds

SW-15 bead appearance is excellent. Operators become more quality conscious, inclined to turn out better welding jobs when they can put in good looking welds so easily. Fine appearing welds aid in the ultimate sale of welded products, build acceptance not otherwise obtainable!

...in usefulness

SW-15 has an unparalleled history of success in many fields. Shipyards, during the war, cut their welding time as much as 50% by actual test and used millions of pounds of SW-15. Farm and construction equipment builders found its ease of application and high resistance to impact desirable, and became large users. Field erectors of vessels and structures adopted SW-15 after testing its speed, ease of application, and x-ray quality in weldments. Every year, more manufacturers turn to the SW-15 electrode to spur production and improve the quality of their welded products.

...in cutting costs

SW-15 is in a class by itself. Elimination of time-consuming slag removal, absence of spatter to be cleaned up, ease and speed of application by any operator, freedom from undercutting, excellent weld appearance that reduces inspection costs, and avoidance of weld repairs, all lower production costs directly. Then, the freedom from worry over possible field failures tops off these reasons for the tremendous use of SW-15 electrodes.

...in your plant

SW-15 has a use in your plant or shop. May we suggest that you write us or contact your local A. O. Smith Distributor for full details and a chance to test this remarkable mild steel electrode.

SMITH way

A.O.Smith

CORPORATION

WELDING PRODUCTS DIVISION

Milwaukee 1, Wisconsin

INTERNATIONAL DIVISION: MILWAUKEE 1, WISCONSIN

A. O. Smith is your best single source for

A.C. AND D.C. WELDING MACHINES

with rated outputs from 180 to 1400 amps.

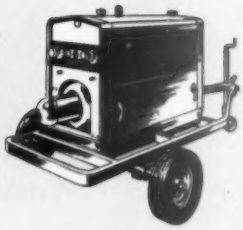
A.C. "CHAMPION"

A.C. "CHALLENGER"

A.C. "AUTOMATIC"

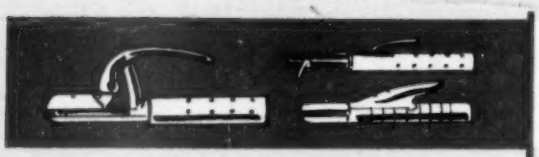
A.C. "UTILITY"

D.C. "RECTIFIER"



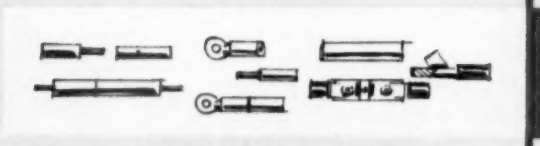
D.C. "FIELD KING"

WELDING SUPPLIES

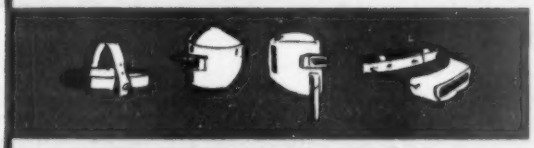


Electrode holders

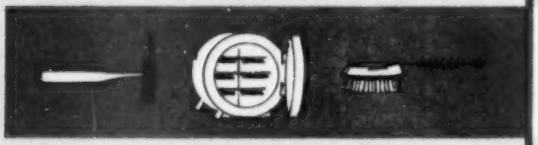
Ground clamps



Cable, connectors, lugs, and splicers



Helmets, shields, headgear, and goggles



Cleaning tools, Electrode drying ovens

Protective clothing and gloves

Simplify your welding buying with

ONE PURCHASE ORDER

A.O.Smith
CORPORATION

WELDING PRODUCTS DIVISION
MILWAUKEE 1, WISCONSIN

INTERNATIONAL DIVISION: MILWAUKEE 1, WISCONSIN

HERE'S AN EMPLOYEE RELATIONS PROGRAM

WHICH MAKES MONEY FOR YOU—AND YOUR EMPLOYEES

You can prove to employees that management has a sincere interest in their personal welfare—through a program that permits them greater earnings, better opportunities for advancement, greater working comfort and safety, less fatigue. And you can prove its value to your company—in specific dollars-and-cents terms.

"EYES RIGHT FOR THE JOB" MEANS BETTER WORKING EFFICIENCY

The program is the Bausch & Lomb Occupational Vision Service. It is a scientific method, based on findings of a continuing study at the Occupational Research Center of Purdue University, for correlating visual skills to job requirements. Now in its eleventh year, it is successfully operating in hundreds of plants, reducing costs and improving employee morale.

A PROVED METHOD TO HELP YOUR PLANT MAKE MONEY 9 WAYS

The Bausch & Lomb Occupational Vision Service is available to you. It is easy to administer. Employee participation is voluntary . . . *and workers like the program.* Benefits which accrue in plants using O.V.S. (benefits which can accrue in your plant, too) include:

1. Improved quality of production
2. Increased production per worker
3. Reduced waste of materials and work rejects
4. Improved accident record
5. Reduced labor turnover
6. Lowered training cost
7. More effective placement
8. Reduced absenteeism
9. Improved employee relations

1853/1953 INTO A NEW CENTURY OF OPTICAL PROGRESS
BAUSCH & LOMB CENTENNIAL

MAIL TODAY!

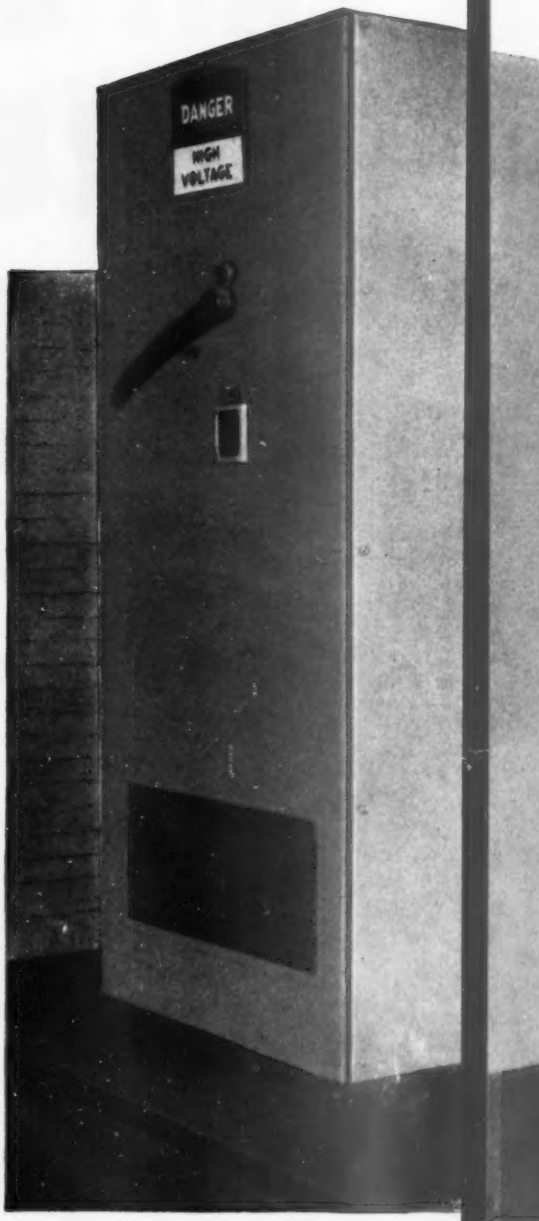
Send for the brochure "Eyes Right for the Job," which tells what the Bausch & Lomb Occupational Vision Service is, how easily it can be administered in your plant, and at what low cost.

Bausch & Lomb Optical Co., 95222 Smith St., Rochester 2, N. Y.

Please send me the brochure "Eyes Right for the Job," and complete details on the Bausch & Lomb Occupational Vision Service.

Name ..... Title .....
Company .....
Street .....
City ..... Zone ..... State .....

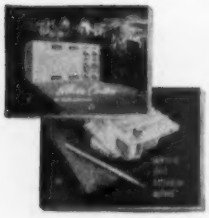
The best way to keep Power Distribution in step with Plant Expansion!



Rock Hill Printing and Finishing Company had a power problem that plagues many industries today. Their rapidly expanding plant was simply growing away from its power source. The resulting overextension and overloading of feeders created conditions that always hamper production: excessive line losses . . . poor voltage conditions . . . frequent service interruptions. But note how effectively a Westinghouse Power Center—serving as an additional distribution point—solved the problem . . .

> "After the installation, we found voltage conditions improved as much as 10 percent . . . line losses reduced 5 percent . . . and unnecessary tripping out completely eliminated.
>
> "Remarkably little time and engineering effort were required in making the installation. We found it almost as simple as plugging in an appliance. And we saved nearly 2000 feet of cable as a result of shorter, low-voltage runs."

This Westinghouse Dry-Type Power Center will enable this user to realize even further savings. The elimination of vaults, oil conditioning and testing, promises a saving in maintenance, virtually eliminates fire hazard, and provides greater safety for operating personnel. Westinghouse Power Centers offer these same advantages to you. J-60777

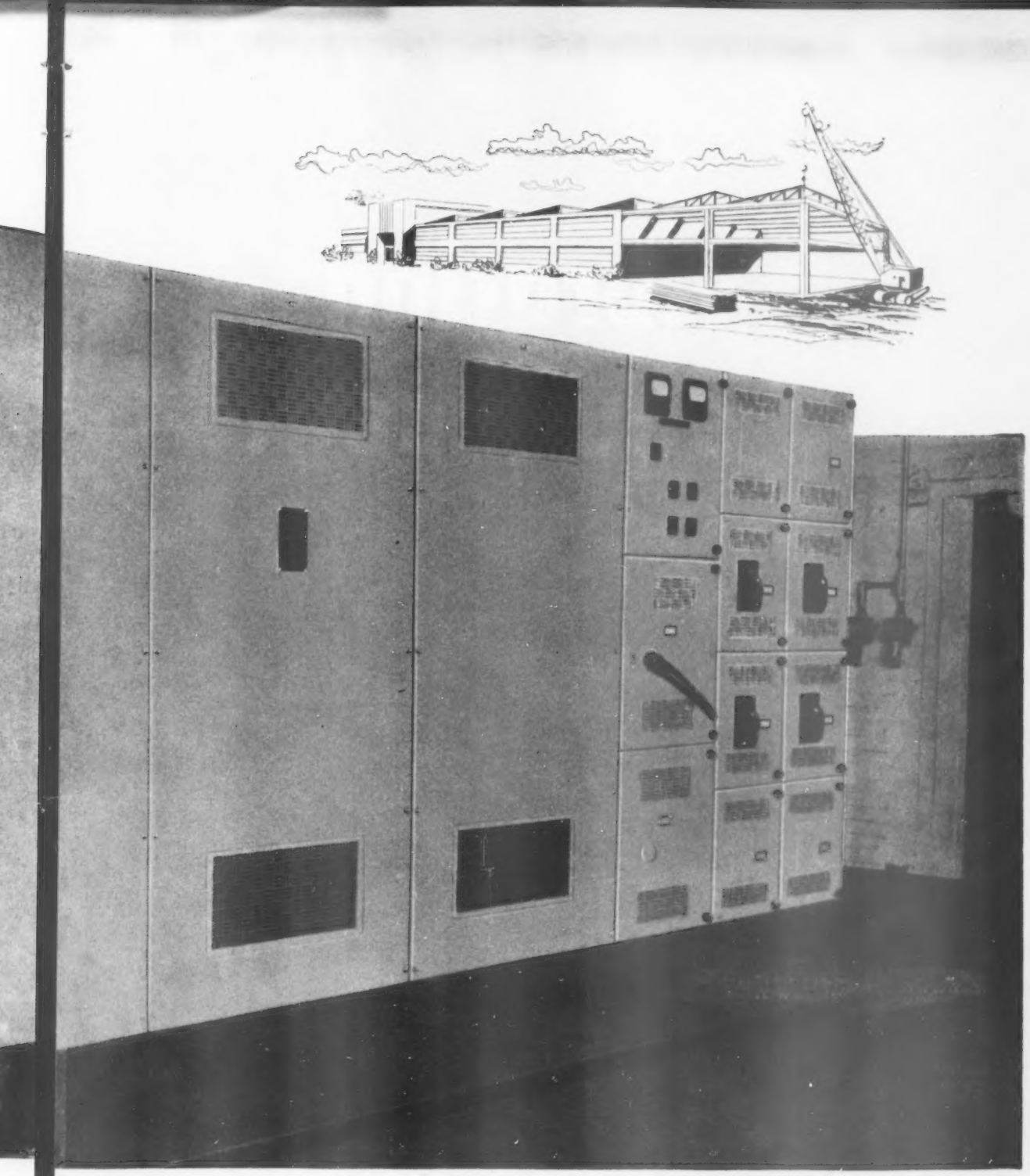


GET THE COMPLETE STORY

Westinghouse Power Centers are the key to efficient power distribution. They offer better service continuity, greater flexibility, better regulation—all the things that contribute to power distribution economy. Most important, they provide the simplest, lowest cost way of attaining the power system that best meets your operating requirements.

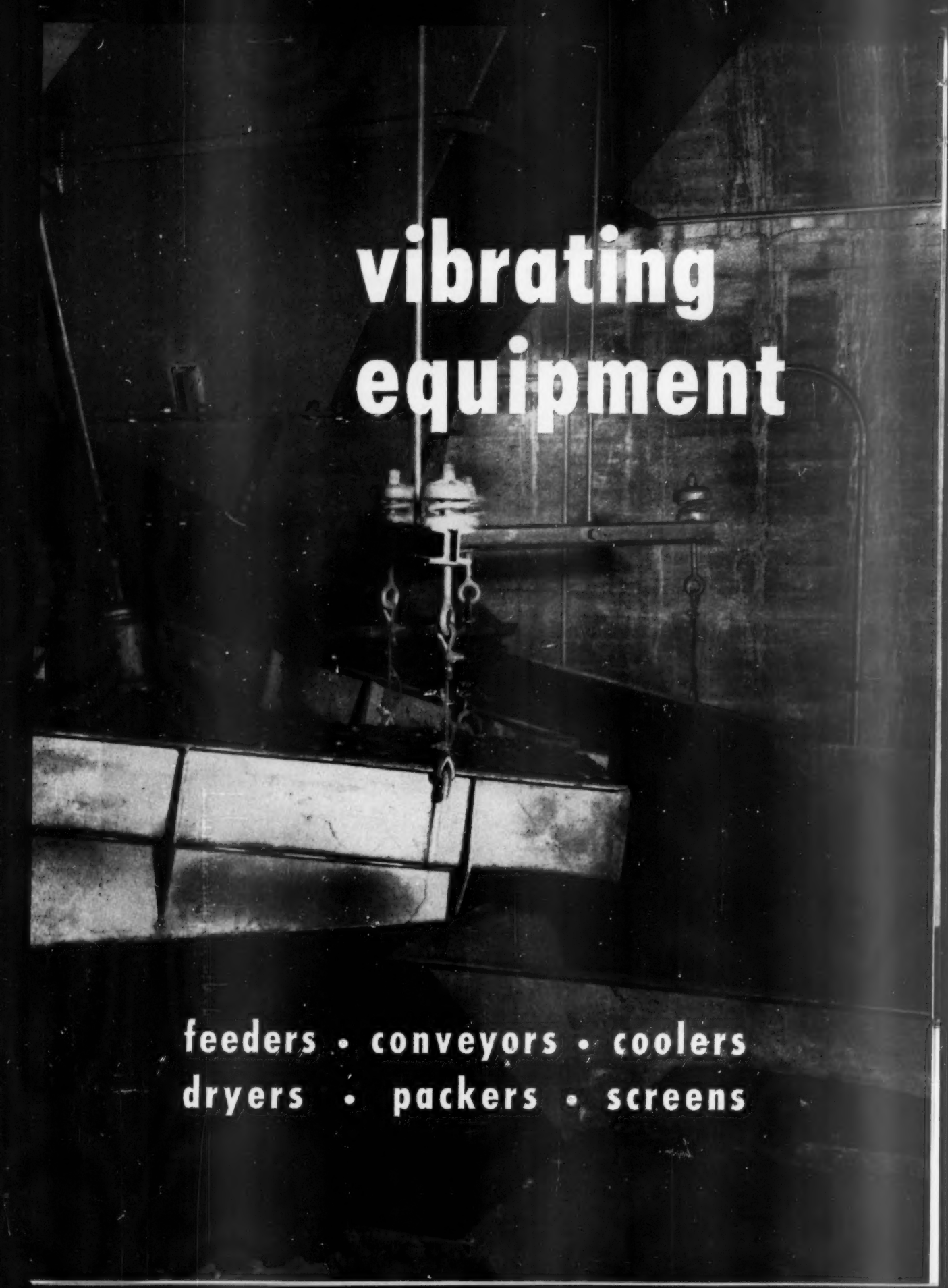
Booklet B-4162 covers Westinghouse Power Centers in detail. Booklet B-4045 discusses various types of plant distribution systems wherein Power Centers offer maximum advantage. For your copies contact your Westinghouse Representative or write: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.

YOU CAN BE SURE... IF IT'S
Westinghouse
POWER CENTERS



AT ROCK HILL PRINTING AND FINISHING COMPANY

Rock Hill, S.C... this Westinghouse Dry-Type Power Center is part of a distribution system as modern as the plant additions it serves. Located near the center of load it makes possible shorter secondaries, lower line losses, better regulation.


vibrating
equipment
feeders • conveyors • coolers
dryers • packers • screens

No. 1-B electric vibrating Feeder—for small-capacity operations up to 3500 pounds per hour. Ideal for laboratory use.

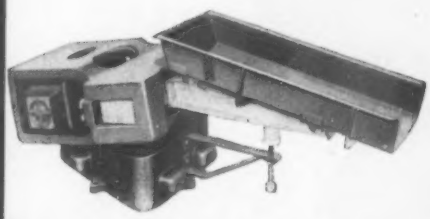
A TYPE AND SIZE TO MEET REQUIREMENTS IN CONTINUOUS PROCESSING at Low Overall Cost.

Absolute control over flow of wide variety of materials.

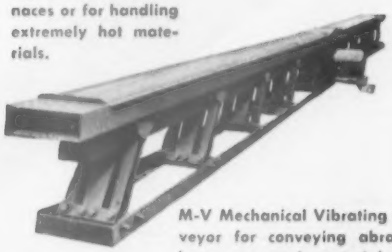
ULTIMATE IN FLEXIBILITY

Literature Available

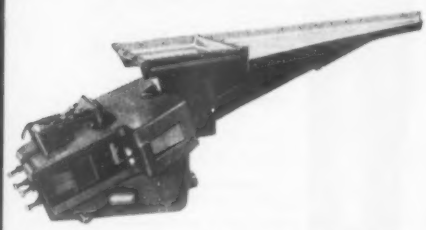
Jeffrey-Traylor No. 4-L Water-cooled Feeder with 10" outside diameter x 4' long water-jacketed deck. For feeding to high temperature furnaces or for handling extremely hot materials.



Jeffrey-Traylor No. 3 electric vibrating spark-proof Feeder with 12" x 30" open-pan deck. For feeding operations in hazardous atmospheres or under extreme moisture conditions.



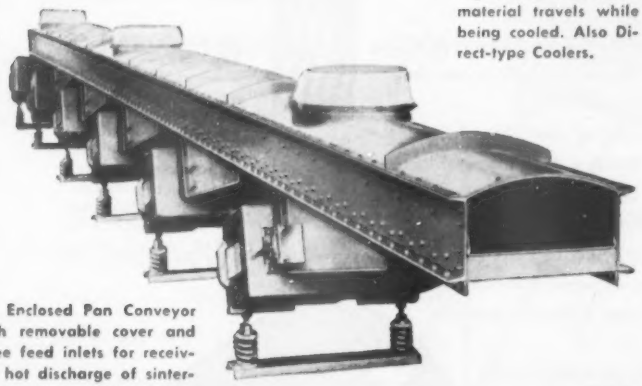
M-V Mechanical Vibrating Conveyor for conveying abrasive, lumpy or rough materials, hot or cold, dry or wet, as well as fine materials. Up to 80' can be operated by one drive unit.



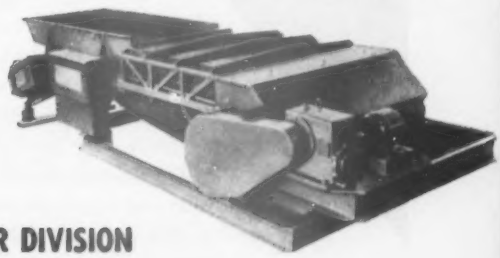
Jeffrey-Traylor electric vibrating Spreader Feeder, 14" wide x 70" long with one edge tapered to spread to 55" width.

Right: Jeffrey-Traylor electric vibrating Indirect-type Cooler. Type HI-21F open type 21" wide and 18' long. Has solid plate conveying surface over which material travels while being cooled. Also Direct-type Coolers.

Below: Jeffrey-Traylor Type 450 WAY-TROL, a precision machine for continuous gravimetric feeding, batching and proportioning. The feeder is weight-controlled, delivery of material being automatcally regulated. Accurate and flexible.



J-T Enclosed Pan Conveyor with removable cover and three feed inlets for receiving hot discharge of sintering machines. A No. 5 electric vibrating type, 25" wide x 45' long.



JEFFREY-TRAYLOR DIVISION

CAPACITIES—FROM A FEW OUNCES TO TWO THOUSAND TONS PER HOUR

THE JEFFREY MANUFACTURING CO.

ESTABLISHED 1877

Columbus 16, Ohio

sales offices and distributors in principal cities

PLANTS IN CANADA, ENGLAND, SOUTH AFRICA

IF IT'S MINED, PROCESSED OR MOVED . . . IT'S A JOB FOR JEFFREY!

WIRE WITH

ROCKBESTOS A.V.C.®

(N. E. C. TYPE AVA)

FOR UNINTERRUPTED OPERATION, REDUCED BREAKDOWNS, LOWER WIRE MAINTENANCE COSTS

IT'S THE A.V.C. CONSTRUCTION THAT MAKES THE DIFFERENCE

OUTER FELTED ASBESTOS WALL

VARNISHED CAMBRIC

INNER FELTED ASBESTOS WALL

You can get life-long dependable service under severe operating conditions because these walls of impregnated felted asbestos permanently resist heat and moisture, mechanical damage and effectively seal the high dielectric varnished cambric tapes from deterioration.

If HEAT is your problem — Rockbestos A.V.C. (NEC TYPE AVA) is your answer to costly power failures and maintenance down time.

Rockbestos A.V.C. Power, Lighting and Control Cables are designed primarily for installation in high ambient locations and to withstand additional operating hazards such as grease, oil, chemicals and corrosive fumes.

Their dense felted walls of thoroughly impregnated asbestos form a continuous insulation to protect the varnished cambric tapes inserted between the walls of asbestos for higher dielectric strength and added moisture resistance.

Plant layouts and expansion programs are given greater flexibility by installing Rockbestos A.V.C. because not only does it provide greater current carrying capacity for emergency demands and future load growth in existing circuits, but the installation of heat generating equipment is not restricted by its nearness to vital electrical circuits.

Write for the booklet "CUTS CABLE COSTS" which lists the practical advantages of ROCKBESTOS A.V.C. for industrial applications in severe or unusual operating conditions.

Hi ...Your best buy

ROCKBESTOS
PRODUCTS CORPORATION
NEW HAVEN 4, CONN.

NEW YORK • CLEVELAND • DETROIT • CHICAGO
PITTSBURGH • ST. LOUIS • LOS ANGELES • NEW ORLEANS • OAKLAND, CALIFORNIA • SEATTLE

WANT TO REDUCE COSTS PER PIECE?

FROSTRODE removes excess heat from the coolant!

Frostrode Coolant Coolers Will Give You—

- **LONGER TOOL LIFE WITH LESS MAINTENANCE**
- **IMPROVED SURFACE FINISH**
- **INCREASED RATE OF PRODUCTION**
- **REDUCTION OF REJECTS**

Users of Frostrode Coolant Coolers have recorded amazing increases in efficiency.

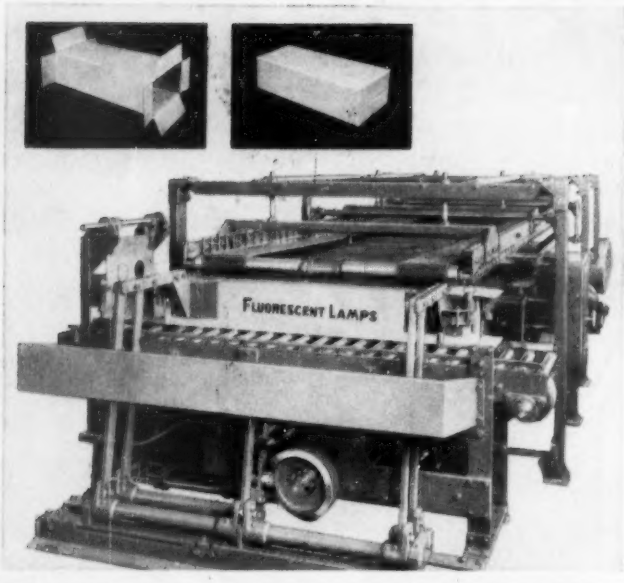
"If you can pump it FROSTRODE can cool it"

Write for examples of FROSTRODE installations applied to machine tools—BULLETIN 502

FROSTRODE® DIVISION OF VIKING PRODUCTS

3066 EAST OUTER DRIVE • DETROIT 34, MICHIGAN

MAKE YOUR SHIPPING DEPARTMENT COST AND QUALITY CONSCIOUS



Side flaps on both ends of carton for fluorescent lamps are glued and sealed on Standard-Knapp unit.

Put a Standard-Knapp Gluer and Sealer unit in your plant and watch the transformation. Every case — not just most of them — emerges with flaps squared, neatly glued, firmly sealed. And this fresh, smart quality look goes hand in hand with sharply reduced costs. Here's why.

SHIPPING CASE IS COMPLETE CONTAINER
You dispense with extra fastening materials and the manpower involved can be assigned to more lucrative jobs. Just feed the cases to the S-K unit. They come off ready for shipping.

SHIPPING CASES STRONG, SECURE
Corrugated and fibreboard cases glued and sealed on S-K units are carrying steel doors, kitchen ranges, television sets, as well as soap and food.

CONTINUOUS OR INTERMITTENT
Automatic S-K Gluer and Sealer units will take continuous output of highest speed production or packing lines. Semi-automatic units will effect economies on intermittent requirements.

S-K MACHINES LAST
Units placed in operation 30 years ago are still going strong, after paying for themselves in the first year. You get ahead and stay ahead.

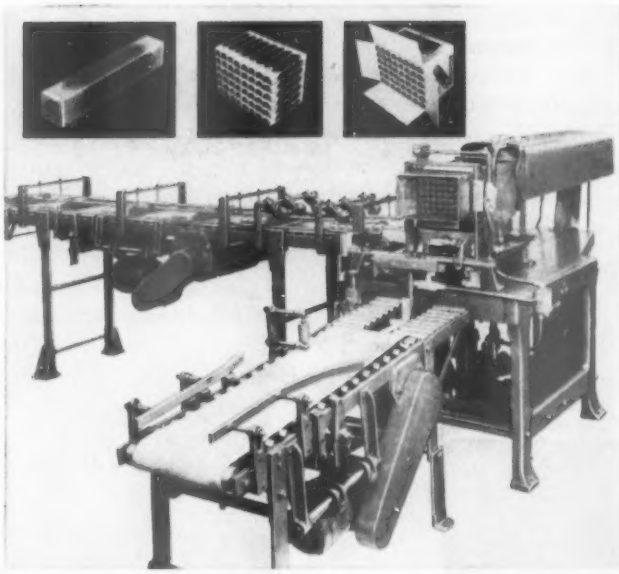
Standard-Knapp unit glues and seals bottom flaps of corrugated case slipped over television sets after leaving final inspection lines.

SALES OFFICES LOCATED IN THE FOLLOWING CITIES:

Atlanta, Ga.	Cleveland, O.	Minneapolis, Minn.	St. Louis, Mo.
Batavia, N.Y.	Houston, Texas	New York, N.Y.	Canada
Boston, Mass.	Indianapolis, Ind.	San Francisco, Calif.	T. C. Fenton
Chicago, Ill.	Los Angeles, Calif.	Seattle, Wash.	Hamilton, Ontario

STANDARD-KNAPP *DIVISION OF EMHART MFG. CO.* **PORTLAND, CONNECTICUT**

PACK OR CARTON YOUR PRODUCT AS EFFICIENTLY AS YOU PRODUCE IT



Cartons of plastic film rolls are loaded into shipping cases on this 806 Standard-Knapp Package Packer.

If you put a carton, bottle, jar, bag or can into a shipping container — or if you put a product into a carton — you can figure on extra income. Standard-Knapp Packers and Standard-Knapp Cartoners will make it for you. These machines, like the best of your manufacturing equipment, reduce your operating costs while improving the end result.

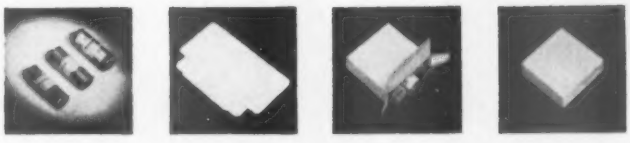
SPEED TO MATCH PRODUCTION OUTPUT
These Standard-Knapp machines load deftly, precisely and swiftly. They will easily absorb the output of the highest speed manufacturing lines.

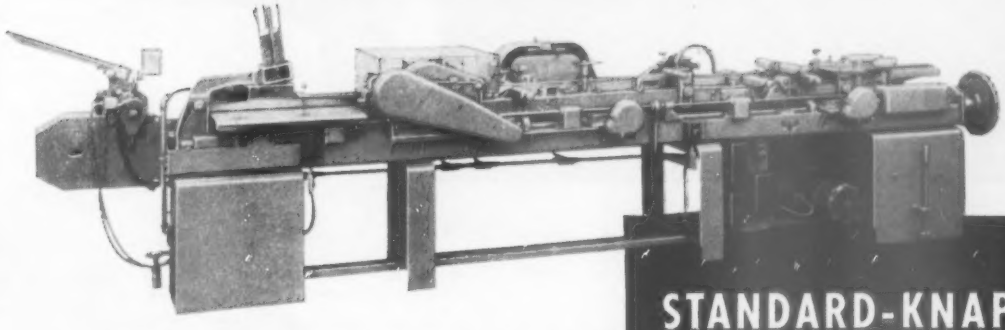
YOU CAN AFFORD S-K MACHINES
Because they pay for themselves in manpower conservation and because they put your packaging operations on the same efficient bases as your most productive mechanized manufacturing systems.

DURABILITY TO MATCH PRODUCTION NEEDS
You can count on Standard-Knapp machines to stay on the job and maintain top efficiency under the gruelling conditions of the highest production requirements.

ADAPTABILITY
S-K machines are built not only to improve your present operations, but are designed to anticipate future requirements.

IF YOU PACKAGE, PACK OR WRAP
NOW is the time for you to get the full story on Standard-Knapp equipment. Please write for catalogs to Dept. M, Standard-Knapp, Division of Emhart Mfg. Co., Portland, Conn.





This Standard-Knapp 180-A Cartoner receives product, sets up unit carton, inserts product and then tucks in carton flaps to complete the package.

STANDARD-KNAPP

DIVISION OF EMHART MFG. CO.

PORTLAND, CONNECTICUT

Only the best is good enough

Half mile of HELIARC TRADE MARK welds OK'D by rigid X-ray tests

A midwest manufacturer was faced with the problem of getting X-ray quality welds in aluminum vessels. These welds were subject to pressure and had to be entirely free from porosity and oxide inclusions. After thoroughly investigating customer specifications, LINDE's service engineers recommended HELIARC inert gas shielded welding for the job.

Since then, about a half mile of these HELIARC welds have been OK'd by 100% X-ray inspections. According to company officials, HELIARC welding was "perfect for the job" and meant real savings by getting X-ray quality welds the first time without expensive rejections or repairs.

Whether you weld aluminum or other hard-to-weld metals, you, too, will find that fast, clean, HELIARC welding will save you time and production costs. HELIARC welding takes place under a shield of inert argon gas which eliminates the need for flux. As a result, HELIARC welds are free from porosity and oxide inclusions. This means fewer rejects and lower finishing costs. In fact, spatter-free HELIARC welds in many cases can be left "as welded."

You owe it to yourself and to your Company to find out more about the cost saving benefits of HELIARC welding. Call your local LINDE representative today. He will be glad to furnish you with detailed information on HELIARC welding.

LEFT Welding heavy aluminum sections with HELIARC *HW-10 torch. These welds were strong, dense, and required little finishing. BELOW The 300 amp.* HELIARC *torch has all-internal water-cooling of both torch head and power cable for cool, long-lasting operation. The HW-10 also features quick electrode adjustment.*

Linde TRADE MARK

LINDE AIR PRODUCTS COMPANY
A Division of Union Carbide and Carbon Corporation
30 E. 42nd St., New York 17, N.Y. UCC Offices in Principal Cities
In Canada: DOMINION OXYGEN COMPANY, LIMITED, Toronto

"Heliarc" and "Linde" are registered trade-marks of Union Carbide and Carbon Corporation.

AUTOMATICITY BACKS UP HIGH VELOCITY TURNING ON FAY AUTOMATICS

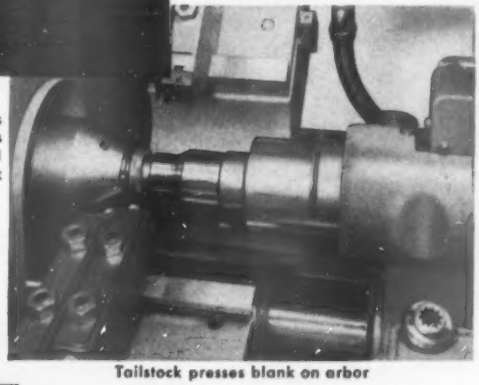
SIDE GEARS
18 Seconds Floor to Floor — 635 SFM

Two 8" Fays, with Automatic Sequential Control, machine all exterior surfaces of the blanks in two operations; one machine for each. The major diameter is 2-15/16" and floor to floor time is approximately 18 seconds in each operation.

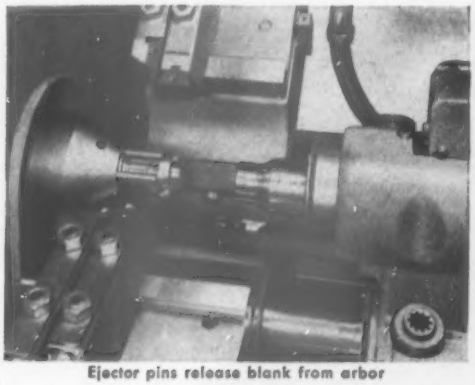
Automatic Cycle—The machines are equipped with automatically operated splash guards and automatically air-operated tailstock rams for pressing the blank onto a splined arbor equipped with automatically operated ejector pins.

The operator places the blank on the end of the arbor, and pushes the cycle start button. *Automatically, the guard closes, the tailstock ram presses the piece onto the arbor and then retracts. The carriage turns, the back arm faces, and at the end of the cuts, ejector pins push the piece onto the loading section of the arbor* from which it is removed manually.

FIRST OPERATION:
Note intricate movements of the carriage, which turns the hub, back angle and major diameter. The back arm faces and forms.



Tailstock presses blank on arbor



Ejector pins release blank from arbor

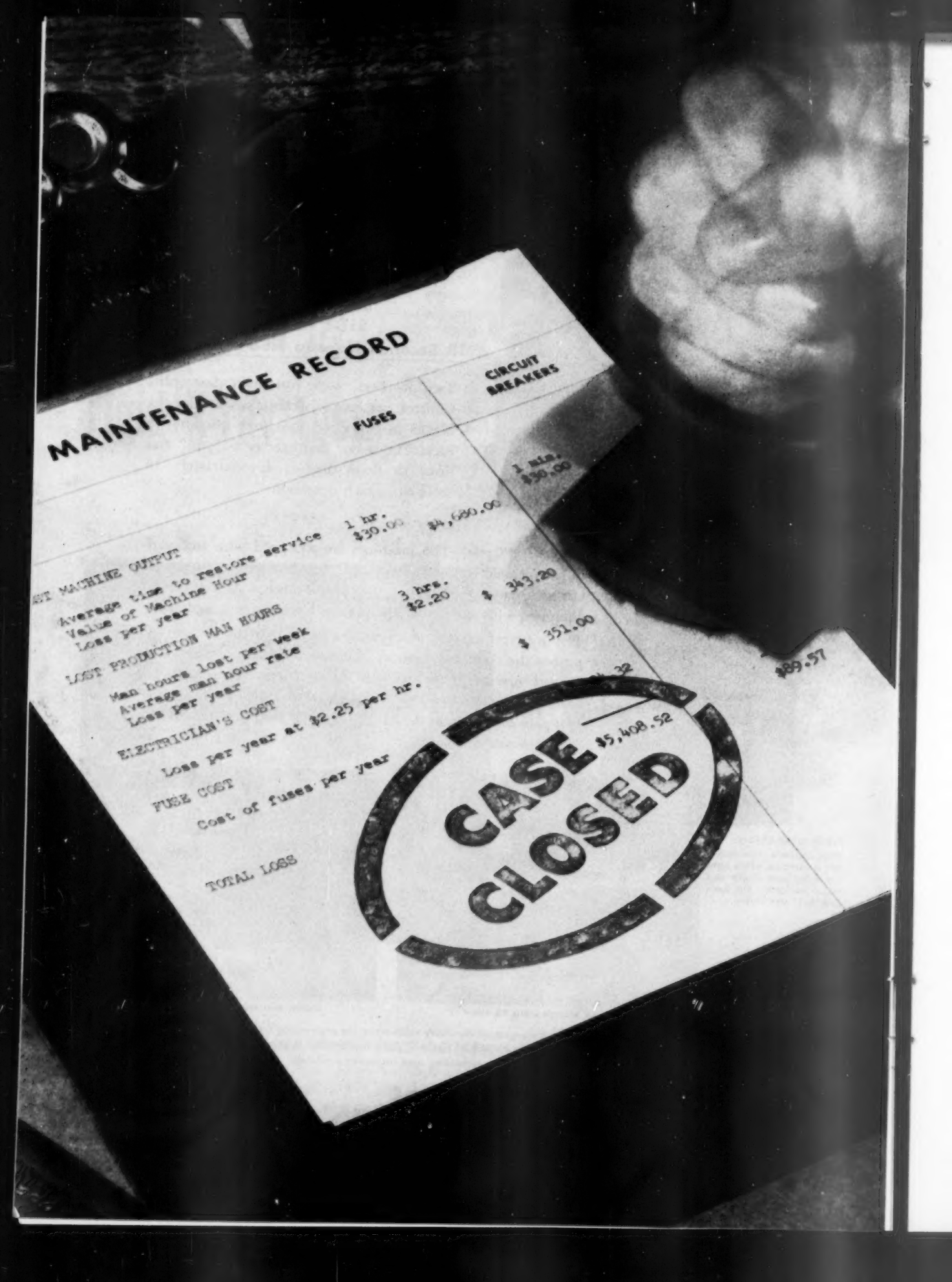
Production management regularly relies upon the engineering services of Jones & Lamson for the latest information on methods, costs, tooling and performance. Why not consult us about YOUR *turning, threading and inspection problems.*

JONES & LAMSON

Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE CO., 505 Clinton St., Dept. 710, Springfield, Vt., U.S.A.

FAY LATHE DIVISION


MAINTENANCE RECORD
FUSES
CIRCUIT BREAKERS
1 min. $30.00
1 hr. $30.00 $4,680.00
Average time to restore service
Value of Machine Hour Loss per year
3 hrs. $2.20 $ 343.20
LOST PRODUCTION MAN HOURS
Man hours lost per week
Average man hour rate
Loss per year
$ 351.00
ELECTRICIAN'S COST
Loss per year at $2.25 per hr.
$89.57
FUSE COST
Cost of fuses per year
$5,408.52
TOTAL LOSS
CASE CLOSED

The case of the—

$5408 MISTAKE

Solution? On normal service interruptions, Westinghouse Circuit Breakers saved up to 98% down time costs

The real cost of fuses is down time. Being nickeled and dimed to death with fuse replacements is only part of the story. This manufacturer found that total cost of down time, due to outages with fuse protection, was $5408 in a single year. When Westinghouse Circuit Breakers were installed, outage overhead dropped to $89.

Why this great difference? Blown fuses mean idle men—idle machines. Production stops. You lose money until an electrician replaces the fuse.

This costly mistake is being repeated in countless installations. What is unnecessary down time costing you?

With Westinghouse De-ion® Circuit Breakers, a flip of the handle, after a circuit interruption, puts you back into production in an instant—no need to call an electrician. And another plus—Westinghouse Circuit Breakers do not trip on normal overload surges, but ride them out and save you one unnecessary outage after another.

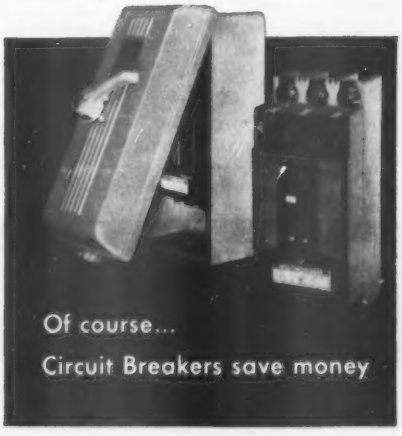
Calibration of Westinghouse Circuit Breakers is exact, tamperproof for the life of the installation, assuring you year-after-year protection against short circuits and dangerous overloads.

Call your Westinghouse Representative or write for the booklets below, Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.

J-30134

YOU CAN BE SURE...IF IT'S

Westinghouse



Please send me the booklets checked:

_____B-5407 "AB Circuit Breakers, the Complete Line"

_____B-5456 "Reduce Down Time and Maintenance with AB-I Circuit Breakers"

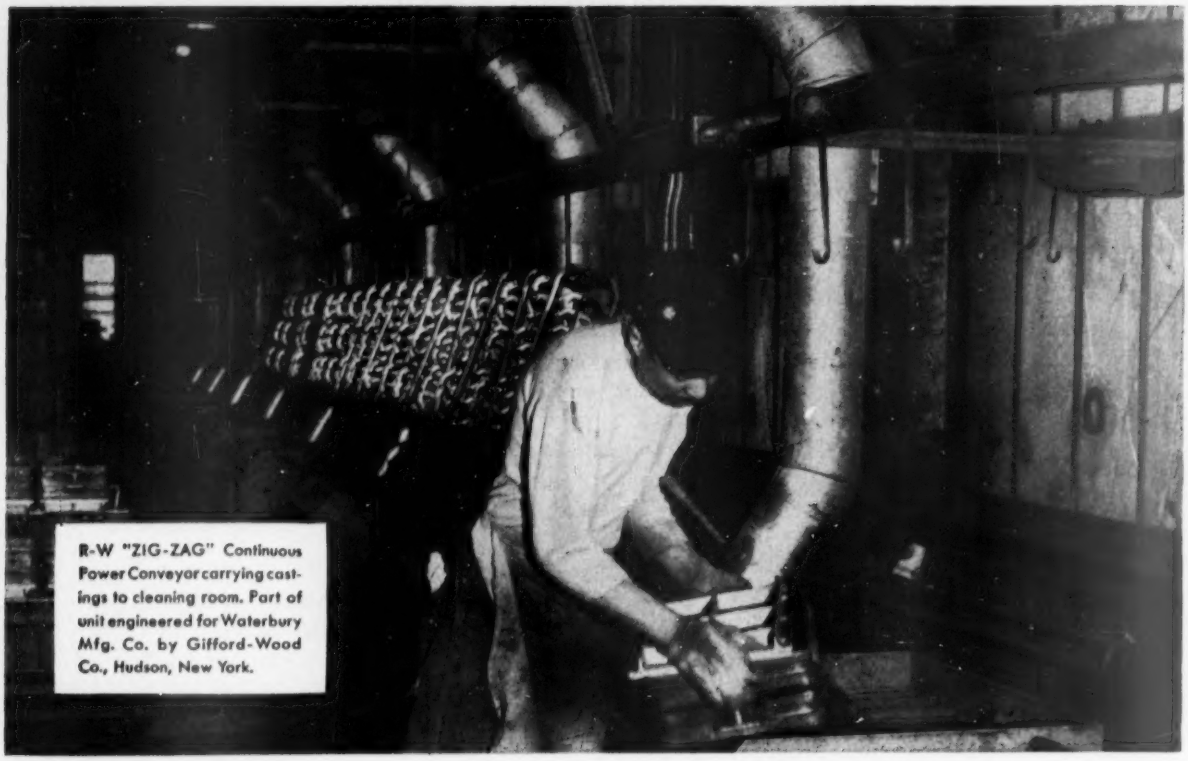
Name and Title _____

Company _____

Address _____

City and State _____

Modern industry chooses
Richards-Wilcox Conveyor Equipment



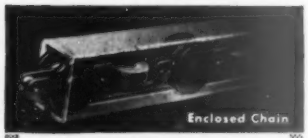
R-W "ZIG-ZAG" Continuous Power Conveyor carrying castings to cleaning room. Part of unit engineered for Waterbury Mfg. Co. by Gifford-Wood Co., Hudson, New York.

The key to materials handling efficiency is *flexibility* . . . the kind of flexibility you find in a R-W "ZIG-ZAG" Continuous Power Conveyor. It travels up, down, in, out and around . . . like water through a pipe . . . in most cases utilizing space that would otherwise be wasted. ZIG-ZAG moves steadily on the job, requiring a minimum of personnel and reducing bottlenecks and handling mishaps.

Because of these savings . . . in space, personnel, time and safety . . . the Gifford-Wood Company of Hudson, New York, designed and installed a complete Richards-Wilcox ZIG-ZAG Conveyor System for the Waterbury Manufacturing Company, Division of Chase Brass & Copper Co. This unit, designed to handle castings after shakeout, effected remarkable savings in production space, overall production time and maintenance costs.

• • •

Find out how you can raise efficiency, lower costs. Write today for consultation. There's no obligation on your part.



Enclosed Chain

Engineered for Economy and Flexibility

- Horizontal and vertical units alternate in a continuous chain traveling through special steel tubing.
- Complete flexibility for installation in any plant. Easily installed, easily changeable to conform to plant alterations.
- SAFE—all moving parts are fully enclosed.
- Low first costs. Low Power Factor.
- Standard horizontal or vertical curves —two-foot radius.

1880 RICHARDS WILCOX R-W AURORA TRADE MARK Reg. U. S. Pat. Off. 1953

SLIDING DOOR HANGERS & TRACK • FIRE DOORS & FIXTURES • GARAGE DOORS & EQUIPMENT • INDUSTRIAL CONVEYORS & CRANES • SCHOOL WARDROBES & PARTITIONS • ELEVATOR DOOR OPERATING EQUIPMENT

Richards-Wilcox Mfg. Co.

MATERIALS HANDLING DIVISION

410 THIRD STREET, AURORA, ILLINOIS

Despite cleanliness and efficiency of a midwest firm's Plastic Division, shown above, there was "dirty work" afoot in the hydraulic systems of the injection molding machines. Division superintendent (left) and A. L. Seabaugh, of Standard Oil, came up with a solution.

Stops "dirty work" in hydraulic units

● A midwest company became increasingly aware that hydraulic oil performance in its fourteen injection molding machines was not all that it should be. Formation of oil deposits not only made frequent cleaning of filters necessary but posed a threat to efficient operation of the hydraulic units.

A Standard Oil lubrication specialist recommended STANOIL Industrial Oil, a top quality product of exceptionally high stability and containing necessary additives to prevent corrosion and oxidation troubles.

Throughout six years of continuous hard use, STANOIL has provided clean operation. It has not been necessary to replace any of the original fills of STANOIL, and only a small amount of make-up oil has been needed. Where filters previously had to be cleaned at least four times a year, they are now cleaned once each year. Hydraulic operation has been efficient and reliable.

STANOIL
TRADE MARK
Industrial Oil

You can rely on STANOIL to give you the same clean, dependable service not only in hydraulic units but in a wide variety of equipment. You can get the help of the Standard Oil lubrication specialist serving your section of the Midwest by phoning your local Standard Oil office. Or, write: Standard Oil Company, 910 S. Michigan Ave., Chicago 80, Illinois.

What's YOUR problem?

A. L. Seabaugh, working out of Standard's Chicago office, is the lubrication specialist who helped this midwest firm gain both operating and maintenance benefits through use of STANOIL in hydraulic units.

Located throughout the Midwest is a corps of specially trained, experienced Standard Oil lubrication specialists, ready to give you prompt, on-the-spot help with lubrication in your plant. Their broad background of practical experience, plus their thorough training in Standard Oil Lubrication Engineering Schools, is yours for the asking. Simply phone your nearest Standard Oil Company office. The lubrication specialist will call without delay. He has a complete line of petroleum products to offer, including such outstanding lubricants as:

SUPERLA Greases — Available in a wide range of consistency grades and in both lime-soap and soda-soap types. SUPERLA Greases cover a wide range of operations. These efficient products are comparable in quality with the highest type of special greases.

STANOLITH Greases — Because these unique lithium soap products possess the heat resistant properties of soda-soap greases and the water resistant properties of lime-soap greases, they offer a solution to lubrication problems caused by the presence of both heat and water.

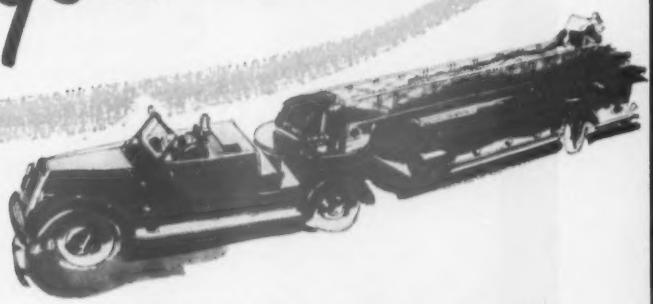
STANDARD OIL COMPANY

STANDARD (Indiana)

Call Your SIMONDS
CAPTAIN
ENGINE
1

DISTRIBUTOR

he gives you "Fire Engine Speed" in delivering your orders



"Bachelor of Saws" specially educated in cutting tool applications

Always Ready to "Hunt Down" New Ideas

Business Services that save your time and money

He comes on the jump . . . any time of the day or night . . . when the alarm sounds from your plant for quick delivery of Simonds Saws, Machine Knives or Files. So you don't have to sit by and watch valuable production time go up in smoke for want of replacement cutting tools.

This is one of the vital services which *your* Simonds Industrial Supply Distributor is always ready to offer *you* . . . quick delivery that saves you time . . . ample stocks that are always available . . . simplified paperwork (one order, one bill, one payment) . . . hunting down new product developments . . . help in solving engineering problems. And he knows the practical application of Simonds Cutting Tools . . . the tools that are 100% quality-controlled, from steel to finish-grinding. So call the nearest Simonds Distributor at any time. He'll come at the drop of a hat . . . *any hat you want him to wear!*

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SAW AND STEEL CO.

FITCHBURG, MASS.

Factory Branches in Boston, Chicago, San Francisco and Portland, Oregon.
Canadian Factory in Montreal, Que.
Simonds Divisions: Simonds Steel Mill, Lockport, N. Y.
Simonds Abrasive Co., Phila., Pa. and Arvida, Que., Canada

Wagner

Protected Type Motors

solve tough production problems

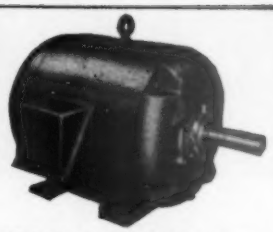
Do you need motors to operate under severe conditions? If you do—you can solve your problem easily with Wagner's complete line of protected type motors.

They are specifically designed for use wherever EXTRA protection is demanded —for bearings or windings . . . against corrosive vapors or abrasive dusts . . . in explosive atmospheres or in exposed outdoor locations.

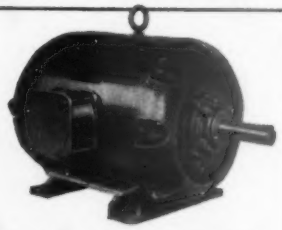
In their specific applications, each of these Wagner Motors assures complete protection of vital parts. Wagner Motors are backed by more than sixty years of motor building experience.

* * *

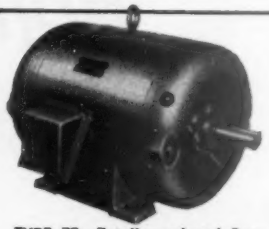
A Wagner engineer will be glad to help you select the correct motor for *your* specific application. Consult the nearest of our 32 branch offices, or write for Bulletin MU-185 for complete information.



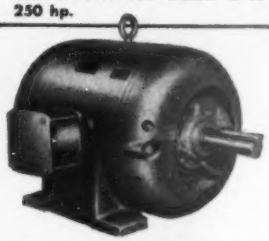
TYPE CP—Totally-enclosed Fan-cooled. Steel frame. 1 to 250 hp.



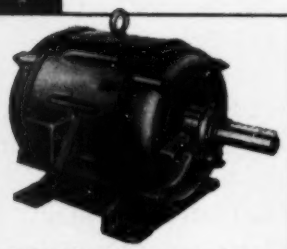
TYPE HP—Explosion-proof. Steel frame. 1 to 250 hp.



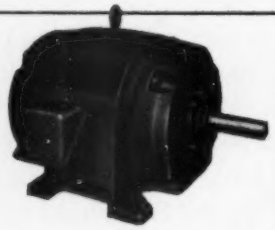
TYPE EP—Totally-enclosed Fan-cooled. Cast iron frame. 2 to 250 hp.



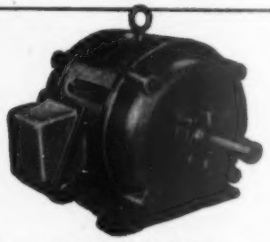
TYPE JP—Explosion-proof. Cast iron frame. 2 to 250 hp.



TYPE RP—Drip-proof. Steel frame. ⅛ to 400 hp.



TYPE XP—Splash-proof. Cast iron frame. ¾ to 200 hp.



TYPE TP—Totally-enclosed, non-ventilated. ¼ to 15 hp.

Wagner Electric Corporation EST. 1891

WAGNER ELECTRIC CORPORATION
6412 Plymouth Ave., St. Louis 14, Mo., U.S.A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS • AIR AND HYDRAULIC

BRANCHES IN 32 PRINCIPAL CITIES

M53-10

cut pump-down time in half!
increase operating efficiency!
of....

Vacuum pumps

with
the
new
Houdaille

WATER-OIL
SEPARATOR

● **Removes moisture from vacuum pump oils; cuts pump-down time in half...** Keeps oil clean and dry. Enables pump to provide a high vacuum *without oil change* and eliminates pump "drying out" maintenance!

● **Eliminates changing or discarding of oil; allows maximum pump operating efficiency...** Increases production due to less downtime. Actually provides *2-way protection*—filtering out contaminants from oil as it separates water!

DRI-PURE is easy to install—can be hooked up to service one or more vacuum pumps depending on the application. *Quickly pays for itself in oil savings alone!*

WRITE TODAY for complete information. Equipment Bulletin available on request.

Henan-Crane Corp.
325 Superior Ave., Lebanon, Indiana
a subsidiary of....
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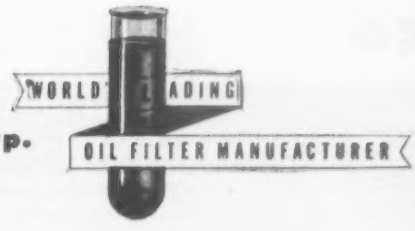
W. E. Micklethwaite, Toronto 18



an ACCO product

Is Hoist Headroom a Headache for You?

● Look at this. The bearing point of the hook of this **WH-1** Low Headroom WRIGHT *Speedway* Hoist can be raised so it is only 12¼ inches below the beam. And this is a 1-ton hoist with the five key features that make WRIGHT *Speedways* last longer and require less servicing.

This hoist has heat-treated and surface hardened alloy steel gears, hard alloy silver electrical contacts in controller, heavy duty crane type safety limit stop, automatic multiple disc load brake, and ball bearing gear shafts.

Add to this grooved cable drums, improved plow steel preformed cable, concealed motor wiring, completely enclosed and ventilated weatherproofed housing, etc., and you'll have a combination of features found only in the WRIGHT *Speedway* Hoist.

Best of all—WRIGHT *Speedways* are priced no higher than ordinary hoists. In the long run they'll cost you less. So see your WRIGHT Hoist distributor today for full information or write our York, Pa., office.

York, Pa., Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

ACCO

TRADE MARK

WRIGHT HOIST DIVISION
AMERICAN CHAIN & CABLE

In Canada: UPTON, BRADEEN & JAMES LTD.
Montreal, Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Vancouver

WRIGHT
Hoists
Trolleys
Cranes

Ford has installed DRAVO *Counterflo* Space Heaters in 17 of its parts depots

In planning the heating system for 17 of its parts depots in various parts of the country, Ford Motor Company wanted to:

1. Keep floor areas free for maximum storage
2. Heat large warehouse areas
3. Provide uniform heat throughout the area

Typical of the Dravo *Counterflo* Space Heaters installed by Ford is the one illustrated at its Cleveland Parts Depot. Dravo Heaters provide:

ADAPTABILITY—Dravo Heaters are mounted horizontally on overhead girders, 16 ft. above the floor, saving valuable storage space and allowing maximum use of the floor area.

PENETRATION—Dravo Heaters' high-capacity fans re-circulate the air completely throughout the 140,560 sq. ft. area in 25 minutes, despite the tiering of material in uneven heights. Directional louvres guide the flow of air. The area can be warmed quickly in winter and cooled easily in summer.

ECONOMY—Dravo Heaters are thermostatically controlled to keep temperatures constant. Installation cost was kept to a minimum, because no ductwork was required. Minimum efficiency is 80%. Roof heat losses are low.

These and many other advantages can be yours when you install Dravo *Counterflo* Space Heaters in your commercial or industrial building. Write for complete details. Use the coupon.

DRAVO
CORPORATION

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CLEVELAND • DETROIT • INDIANAPOLIS • NEW YORK
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Sales Representatives in Principal Cities

Manufactured and sold in Canada by Marine Industries, Ltd., Sorel, Quebec. Export Associates: Lynch, Wilde & Co., Washington 9, D.C.

Dravo Corporation, Heating Department
Dravo Building, Fifth and Liberty Avenues
Pittsburgh 22, Pennsylvania

Send me information about heating for the subjects I've checked, and Dravo Heater Catalog QR 523-2

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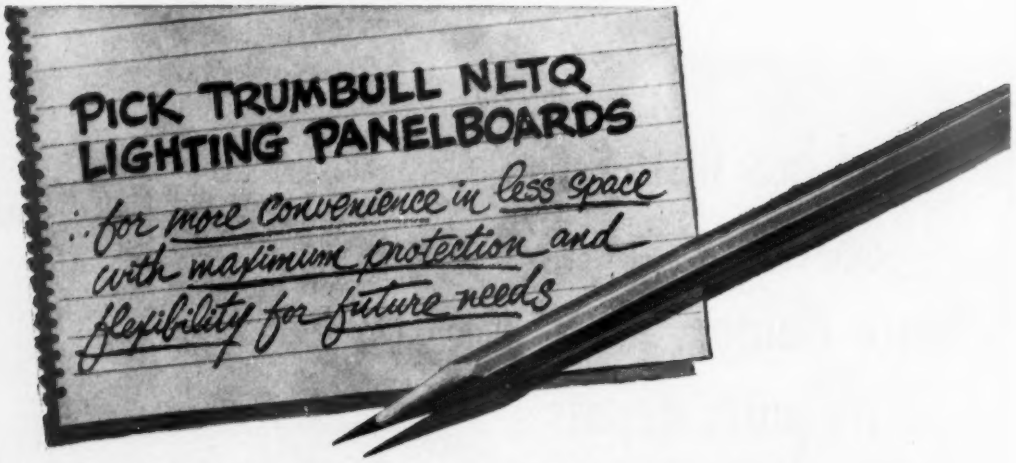
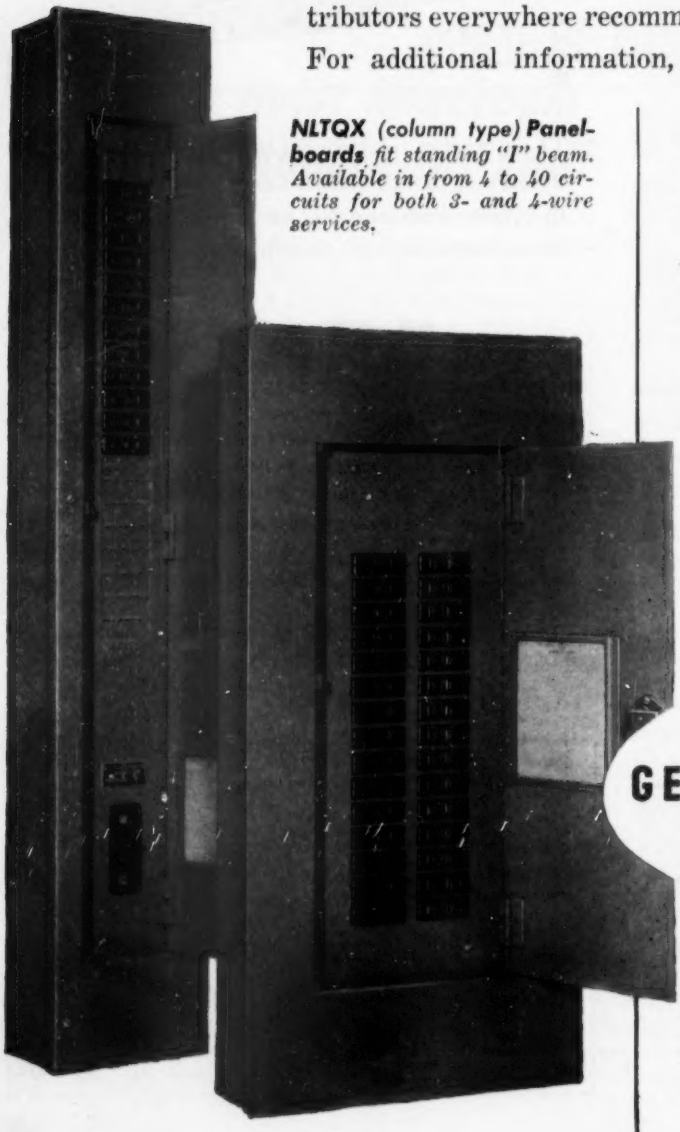
- ☐ For use in conjunction with air conditioning.
- ☐ Please have a representative call at no obligation to me.

Name_____ Title_____
Company_____ Address_____
City_____ Zone_____ State_____



Trumbull's fifty-year leadership in panelboards has never been more in evidence than in its NLTQ line. Leading electrical distributors everywhere recommend them and carry complete stocks. For additional information, let us mail you Bulletin TEB-14.



***NLTQX** (column type) **Panelboards** fit standing "I" beam. Available in from 4 to 40 circuits for both 3- and 4-wire services.*

3 WAYS BETTER...

1. Circuit breaker convenience and protection. Type TQL. Quick-make, quick-break. Thermal-magnetic trip, arc-quenching design and trip-free action for top protection. Convenient plug-in design and manual re-set. Equally important, it has a separate trip indicating position.

2. Strong compact interiors readily removable for fast installation. Busbars molded in plastisol, and braced against damage from current surges. Run cooler than in open air.

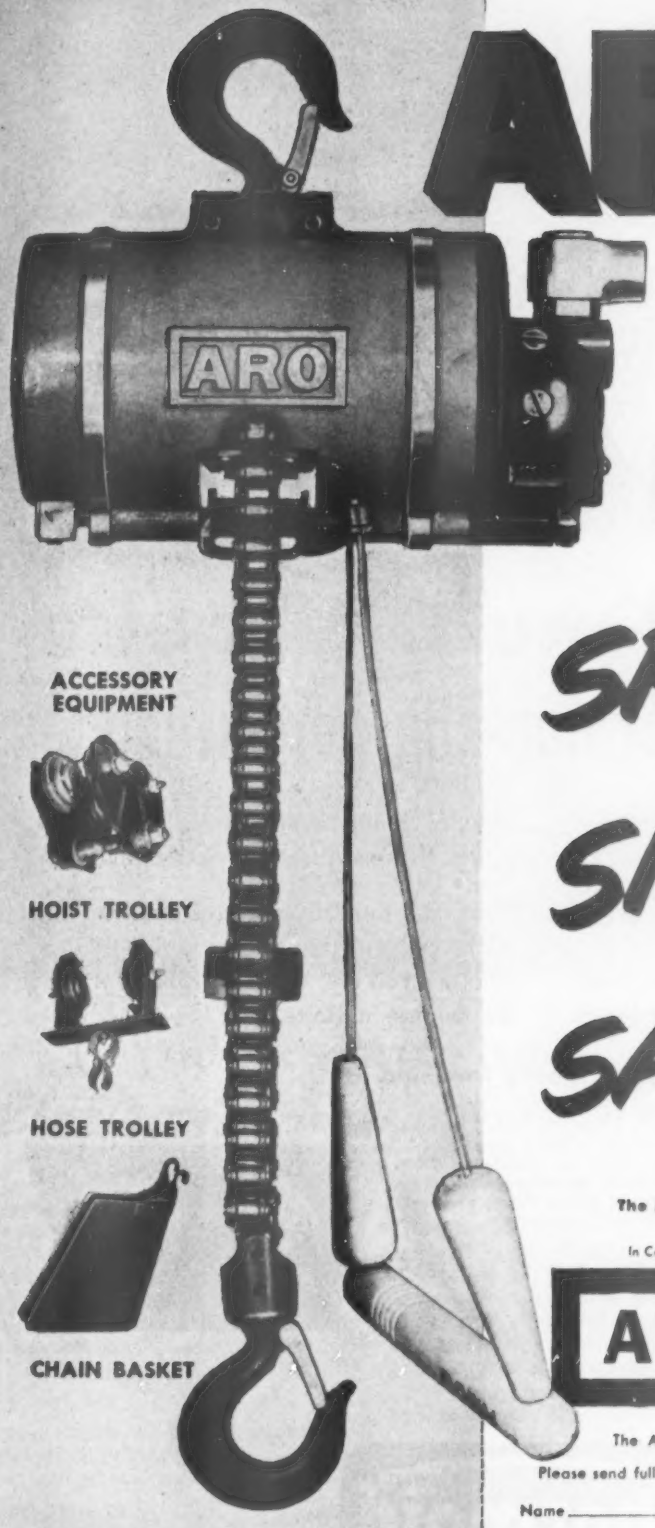
3. Compact boxes, protected fronts. Adequate knockouts and gutters. Front integral with barrier. Breaker knockouts in front panel to provide for future circuits.

GENERAL ELECTRIC

DISTRIBUTION ASSEMBLIES DEPARTMENT
PLAINVILLE, CONN.

***NLTQ Panelboards** available in from 4 to 42 circuits for both 3-wire and 4-wire services with lugs only or Trumbull 50 to 225 ampere breakers in the mains, and TQL 120 volt, 10 to 50 ampere circuit breakers on branches. AC only. Underwriters' Laboratories, Inc. listed.*

ARO



ACCESSORY EQUIPMENT

HOIST TROLLEY

HOSE TROLLEY

CHAIN BASKET

1000 pound AIR HOIST

for

SPEED...

Lift rate...
over 40 ft. per minute!

SIZE...

Overall length 10¼"
weighs only 28½ lbs.

SAFETY...

Betters all
safety requirements!

The Aro Equipment Corporation, Bryan, Ohio
Offices in All Principal Cities
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ARO **AIR HOIST**

Also . . . Air Tools . . . Lubricating Equipment . . . Aircraft Products . . . Grease Fittings

The Aro Equipment Corporation, Bryan, Ohio

Please send full details on the new ARO Air Hoist, without obligation.

Name _____

Company _____

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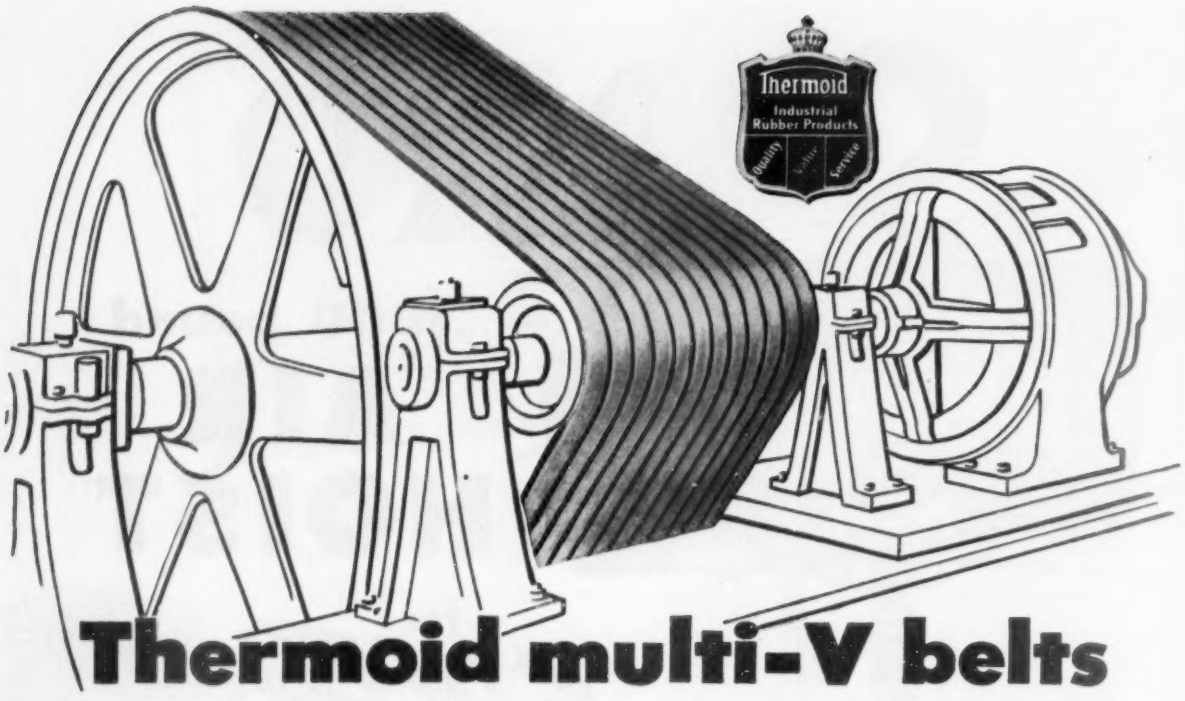
City _____ State _____



Thermoid multi-V belts

pre-stretched for non-slip performance

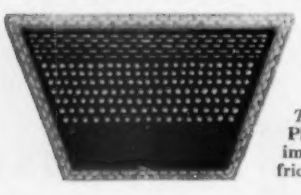
When you use Thermoid *Pre-stretched* Multi-V Belts, you can be sure of maximum power transmission, economical non-slip performance and extra long belt life.

Thermoid Multi-V Belts withstand moisture, abrasion and repeated shock loads.

They're built to take it—specially designed to resist internal friction and heat.

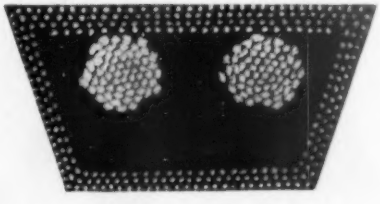
Your Thermoid Distributor can help you with power transmission problems, whether you use Multi-V, F.H.P. or Flat Transmission Belts.

It pays to specify Thermoid.



Thermoid D and E Sections
Grommet type construction assures lower permanent stretch, greater flexing ability and shock absorption.

Thermoid A, B and C Sections
Plied cord construction, latex impregnated to reduce internal friction and heat build up.



Conveyor & Elevator Belting • Transmission Belting
F.H.P. & Multiple V-Belts • Wrapped & Molded Hose

Thermoid

Rubber Sheet Packings • Molded Products
Industrial Brake Linings and Friction Materials

Thermoid Company • Offices & Factories: Trenton, N. J., Nephi, Utah

In your research, too—

ElectroniK instruments can save time and effort

SAVINGS of labor and time — through *ElectroniK* instruments — prove as valuable in the research laboratory as in the production plant. In hundreds of industrial and academic research centers, these instruments are assuming the burden of routine work that has long hindered the progress of many a vital project.

By automatically observing tests . . . measuring critical conditions . . . plotting curves . . . regulating test variables . . . *ElectroniK* instruments free scientists for full utilization of their specialized talents. These tireless "lab assistants" work day and night. They make it possible to run many tests continuously . . . accumulating data at a greatly accelerated pace without adding to personnel work-loads. And they achieve greater speed, precision and consistency than could be possible by human hands.

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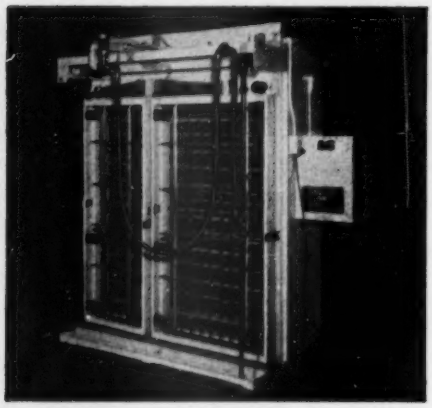
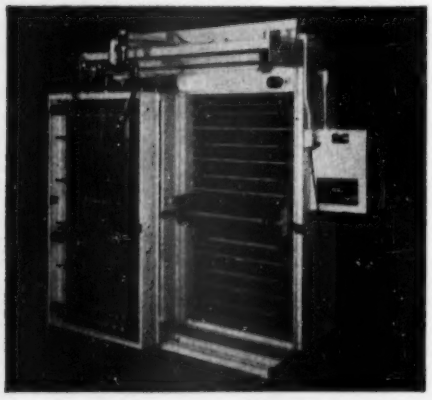
MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 4461 Wayne Avenue, Philadelphia 44, Pa.

● **REFERENCE DATA:** Write for new Bulletin 14-1, "Automatic Instrumentation to Accelerate Research."

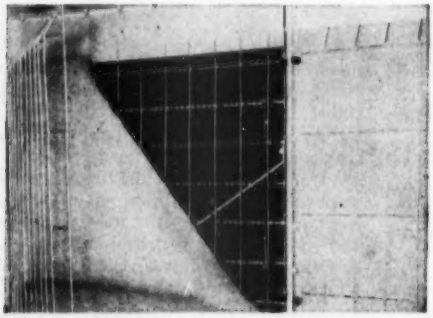
MINNEAPOLIS
Honeywell
BROWN INSTRUMENTS
First in Controls



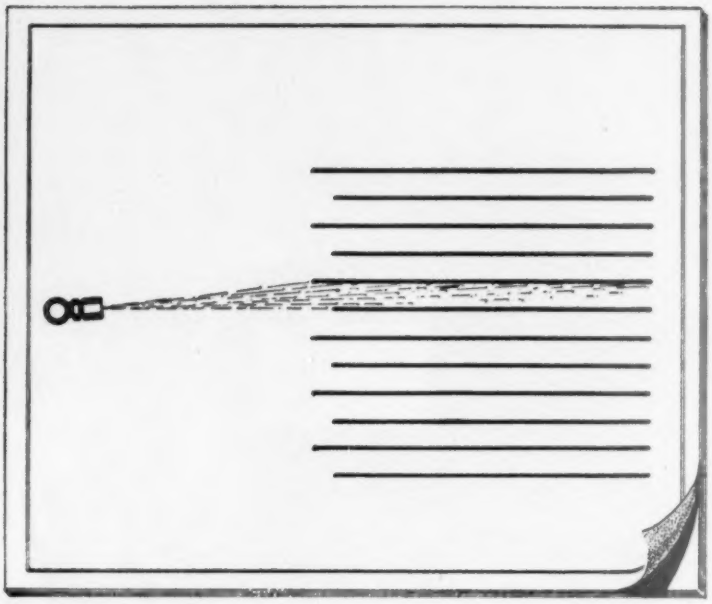
The above illustration shows the hinged ionizer section closed with the new Type "H" Washer in normal position when precipitator is operating. A push-button switch, located on the right-hand side of the above illustration, operates the washer and opens the solenoid valve that controls the water supply. The header makes a complete trip across the face of the precipitator and returns, automatically, to the starting position where it contacts a limit switch that breaks the electrical circuit.



In the above illustration the ionizer section has been opened to show that the washer does not interfere in any way with access to the collector assembly. As in the standard Electro-Cell, the plates are completely removable for thorough cleaning or inspection whenever necessary without the use of any tools or accessories whatsoever.



This illustration shows that the water eliminator frame has been opened to show density of the AMER-*glas* blanket and the ease with which the pad may be removed from the precipitator. If the precipitator is properly maintained and energized electrically at all times during fan operation, the afterfilter will require a minimum amount of attention. Because it is made of fine hair-like glass filaments, the pad is easy and pleasant to handle.



here's the reason for the 5° lead on the traveling spray nozzles on the ELECTRO-CELL TYPE "H" WASHER

The new type "H" Washer is incorporated as an integral part of the ELECTRO-CELL precipitator and provides "push-button" control of the cleaning operation—thus greatly reducing maintenance and increasing the efficiency of the famous ELECTRO-CELL.

The outstanding feature of the new Type "H" Washer is the rotation of the header at each end of the travel to advance the spray nozzles approximately 5° from the vertical. Result—the best possible penetration of the spray water, assuring thorough coverage of the entire depth of the collector plates with the resulting maximum cleaning action and a minimum of water!

The Type "H" Washer is another "first" from AAF and offers better cleaning efficiency and water economy advantages over the standard fixed-nozzle method of "flooding".

Write the American Air Filter Company for technical data and descriptive information on this latest AAF achievement. And remember—AAF experience will help you solve all your air cleaning problems.

expect the best from ..... AAF

American Air Filter

COMPANY, INC.

361 Central Avenue, Louisville 8, Ky.

American Air Filter of Canada, Ltd., Montreal, P. Q.

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STATE
for BETTER
Surface Grinding
Use QUALITY Segments
Facts about BAY STATE segments . . .
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2. RAPID SERVICE. Excellent delivery schedules from large stocks and completely modern manufacturing methods.
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4. PRICE ADVANTAGE. BAY STATE's special 8A abrasive, at a non-premium price, will work wonders on your tool room surfacing jobs . . . further, there is no extra charge for the BAY STATE bonus of outstanding, consistent performance.
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Complete protection for ESSENTIAL DRIVES

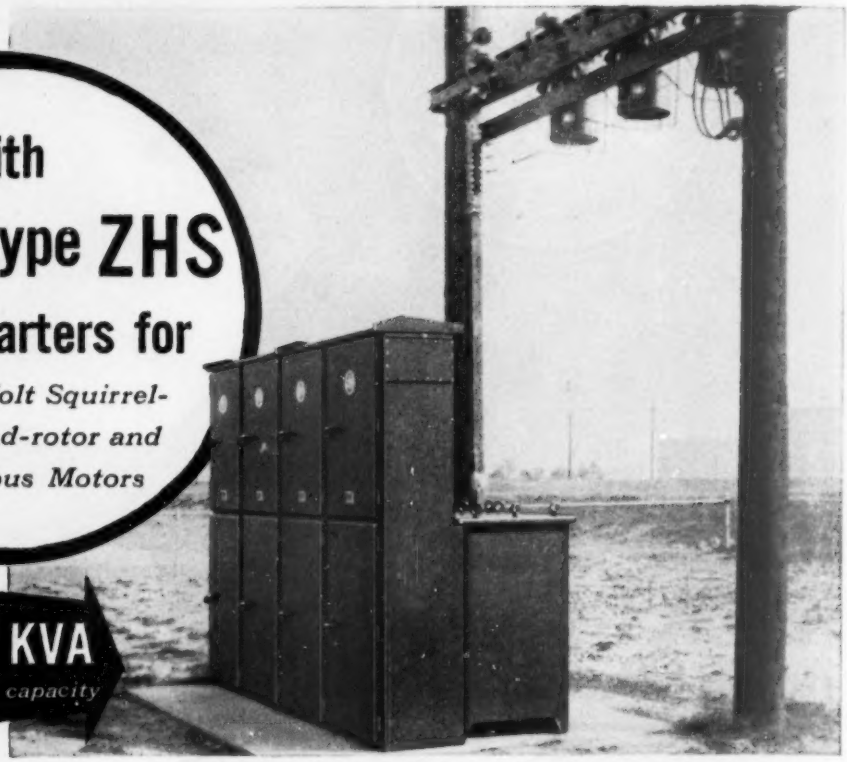
with

EC&M type ZHS

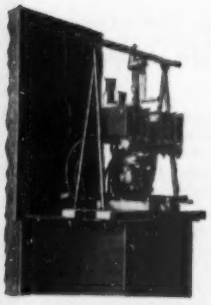
motor starters for

2300 - 5000 Volt Squirrel-cage, Wound-rotor and Synchronous Motors

50,000 KVA
interrupting capacity



Four EC&M High Voltage Starters, outdoor mounted in Sun Oil Company's Sun Station Terminal at Nederland, Texas, provide push button remote starting and full protection for the motor-pump drives.



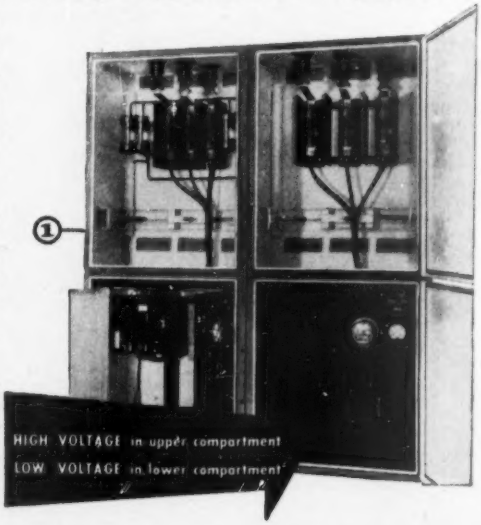
Contactor-lifting mechanism raises ZHS Contactor for easy inspection or contact renewal. No bolts or wires need be removed for this operation.

For important "main-line" drives, EC&M Type ZHS Starters give complete protection these four ways: 1) SHORT CIRCUIT Protection, 2) MOTOR Protection, 3) LOW VOLTAGE Protection, 4) PERSONNEL Protection.

Enclosures available for all requirements. Indoor or outdoor mounting—Type VIII Construction for Class I, Group D Hazardous Locations and Type IA for dusty atmospheres.

When making initial cost estimates, get the facts on EC&M High Voltage Starters. Our nearby office will be glad to supply full information on starters which give complete protection.

Write for Bulletins 1062 & 79-117



① **Provision for future mounting of VALIMITOR (volt-ampere-limitor) coils for unlimited protection—bus KVA capability may be infinite.**

THE ELECTRIC CONTROLLER & MFG. CO.
2698 EAST 79TH STREET ★ CLEVELAND 4, OHIO

DIAMOND

ROLLER CHAINS AND SPROCKETS

A balanced stock meets requirements for all standard drive ratios and popular H. P. capacities*

* ROLLER CHAIN and SPROCKETS, Bushed and Fixed Bore

BUSHED SPROCKETS

With the Taper Bore Sprocket and Bushing, the bushing is changed to meet various bore sizes.

FIXED BORE SPROCKETS

Small size Diamond finished fixed bore stock sprockets (with keyways and set-screws) give the distributor the balanced stock to meet the widest possible chain drive requirements.

STOCK SPROCKETS FOR ALL POPULAR SHAFT SIZES

(Taper Lock and Fixed Bore Types)

The Diamond Chain combination of roller chains, taper bore sprockets and bushings, and the fixed bore sprockets in the small sizes provide for emergency and normal service demands for all standard drive ratios and popular horsepower capacities.

Take advantage of the "over-the-counter" availability of this Diamond stock of Chains and Sprockets for new applications and replacements. This stock is as near as your telephone. See the yellow pages of your classified telephone directory for the address of the Diamond Chain distributor.

DIAMOND CHAIN COMPANY, Inc.

Where High Quality is Traditional

Dept. 449, 402 Kentucky Ave., Indianapolis 7, Indiana

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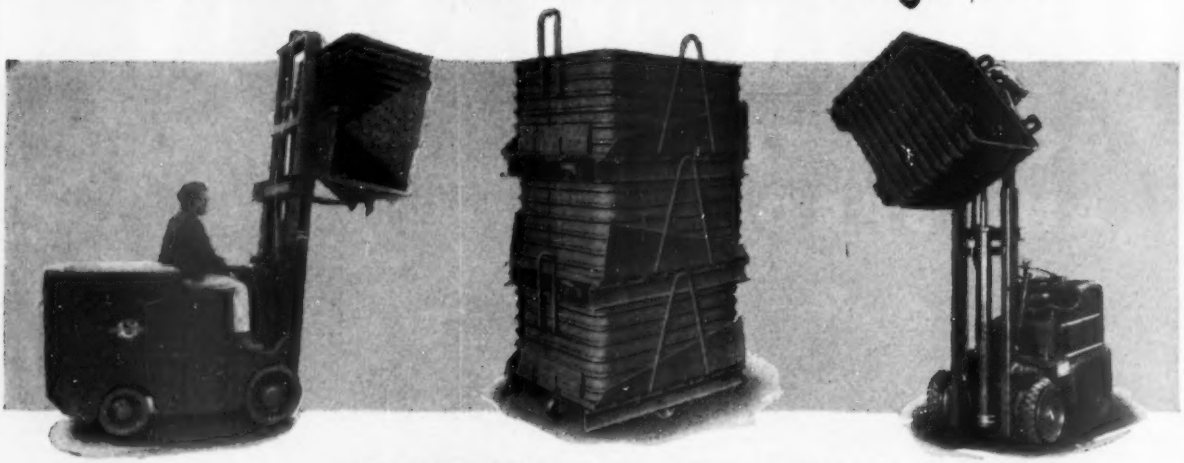
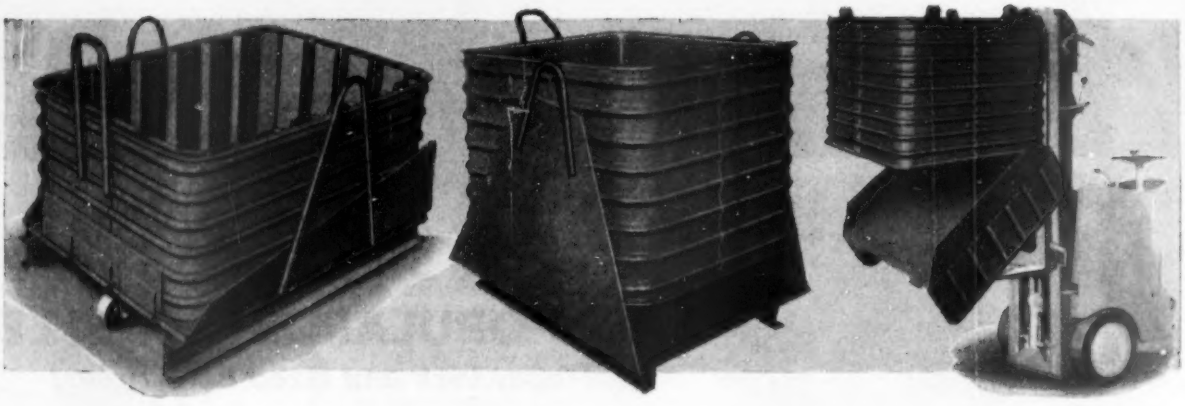
Catalog 753 Mailed on Request

For Faster Materials Handling . . .



There's a **POWELL** Quick Emptying



Container To Fit Every Kind of Job

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Angier's new Glass-wrap is reinforced with strong glass fibres to give *better* protection at less cost. Waterproofed; flexible; up to 96" wide. *Check below for FREE sample & facts.*

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Framingham 1, Massachusetts

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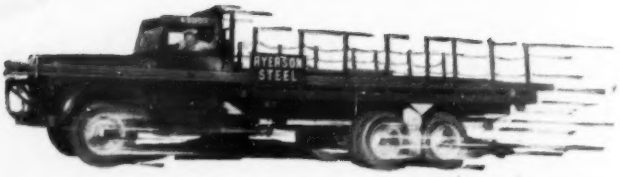

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LOOKING AHEAD IN BUSINESS

Last minute round-up as we go to press

Autumn production figures so far are disappointing. Output of durable goods—steel, construction, machinery—is slipping. Steel production dipped below 90% of rated capacity early in September for the first time since the steel strike last year. It may drop to 85% in the fourth quarter. Scrap prices have fallen steadily. Mills just aren't buying.

Construction activity this fall has not shown the usual seasonal pick-up, either. And retail trade—though very high—is no longer exhibiting the gains it did in recent months.

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Inventories are still a problem. Manufacturers' and retailers' stocks both rose again during the third quarter. Manufacturers' inventories at the beginning of August totaled $45.7-billion, up about $150-million from the beginning of July. Virtually all of this rise was in the durable goods industries.

Retail inventories increased about 2% in July and probably as much again in August. Three-fifths of this increase can be accounted for by the large stock of unsold automobiles still sitting on dealers' floors.

Thus retail inventories, which amounted to $21.4-billion at the beginning of August, were nearly $500-million above the preceding month on a seasonally adjusted basis. Non-durable goods retailers also had higher stocks of apparel and general merchandise.

•

Still there are signs of strength in the picture. Nothing like a depression seems to be in the offing. Business expenditures for plant and equipment—the most dynamic force in our economy—are still running higher than last year. The latest survey by the Commerce Department indicates a decline of 5% from the third to the fourth quarter.

But spending for new plant and equipment this year will still top 1952. It may even outrun the early fourth-quarter estimate. Total capital expenditures for 1953 will be $27.8-billion, according to the Commerce Department. They were $26.5-billion last year.

The farm equipment market is weaker. But it's still large. Last year farmers spent $2.9-billion on new equipment and another $860-million for farm buildings. The Commerce Department estimates they invested 10% to 15% less in new buildings and implements in first half of 1953 than in the same period in 1952. But this drop isn't likely to go much further. Mechanization has raised the minimum amount farmers will spend to maintain efficient production.

•

Although construction activity has fallen off, it is not expected to drop far. There is no big surplus of housing. Builders still count on high demand for newer, larger, and better-located homes. And many public buildings and facilities are still inadequate—highways, airports, schools and hospitals.

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Drop in defense spending won't be great. Defense expenditures may be reduced from around $50-billion in 1953 to about $40-billion next year. But this represents less than 3% of our gross national product. Defense cuts will hit some specialized plants. But over-all the impact won't be anything like the drop after World War II.

•

Another encouragement for 1954 is the prospect of tax cuts. Consumers get an automatic 10% tax reduction in January which will help maintain spending. The January cut adds about $2-billion a year to their incomes after taxes.

•

More props under prosperity: Even with less overtime, wages are still very high and workers have a larger share of the national income than prewar. Almost half of all families now earn at least $4000 per year. This means high living standards even if pay envelopes drop a bit. Also population is growing—families get bigger, and new families are being formed.

Just to keep up with this growth in population, consumer expenditures ought to rise something like $5-billion a year. In two years that would make up for prospective cuts of around $10-billion in defense expenditures and once again start the economy toward higher levels.

LOOKING AHEAD IN LABOR

Last minute round-up as we go to press

Change still dominates the labor scene. A year ago George Meany and Walter P. Reuther took over AFL and CIO reins, Republicans moved into Washington. Today new men are taking charge at National Labor Relations Board, Labor Department, and Senate Labor Relations Subcommittee.

On balance, current changes favor management. Loss of Taft in the Senate, however, is a distinct setback.

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At NLRB, new policies are being hammered out by the new Eisenhower majority. Slowly, the pro-labor Taft-Hartley law interpretations of the Truman-appointed board will be overturned. It's a break for employers and other T-H supporters.

Chairman Guy Farmer is the key to the new policies you will have to live with. Even before the Eisenhower team took over, Farmer got one rule changed—the Firestone doctrine on union shop. Under that rule a worker could be penalized in various ways short of dismissal for refusing to join the union as required by the contract. Like loss of seniority or vacation pay. Now, under the new rule —Krambo Foods case—union and employer must stick to the letter of Taft-Hartley. A worker can only be fired or not penalized at all.

Other new policies you can look for under the new majority are indicated in dissents by Farmer while his side was still in the minority:

Sound trucks—more restriction on their use near polling places in bargaining elections.

Card checks—they will have less weight as proof of a union's majority status.

Free speech—more freedom for employers in questioning workers about union beliefs.

Small business—more disputes involving small employers with only remote interstate connections will be left to the states for handling.

Other new policies have been hinted:

Free speech—reversal of Bonwit Teller rule that union must get equal chance to address employees in bargaining election drives.

Secondary boycotts—stricter application of the secondary boycott ban, particularly against teamster picketing of trucks making deliveries.

Association bargaining—reversal of Davis Furniture principle holding it unfair for association members to lock out employees when union strikes only one association member in "divide and conquer" tactic.

Bargaining during contract—reversal of rule that employers must bargain, during life of contract, on subjects not covered by contract or discussed in earlier bargaining.

Craft units—possible tightening of rules that let craft unions break up plantwide bargaining.

Decisions will be slow coming out of NLRB for the next six months. Board is meeting with all five members instead of splitting up into panels. That is, until the new policies are formulated. This means you may have to wait longer for a decision in your case. Or an election.

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Durkin's resignation as Secretary of Labor ends another "noble experiment," widens breach between labor leaders and Administration. So here's what we may look for:

- Taft-Hartley amendments are not likely to get through Congress next year. If they do, they will be more favorable to management than if the plumbers union president and Taft-Hartley foe had stayed in the cabinet.
- Business leaders will insist on, and get, a better hearing at the White House on labor issues.
- Changes in Labor Dept. will be hardly noticeable if White House remains sensitive to labor criticism. There's some hope of more realistic enforcement of the Bacon-Davis and Walsh-Healy prevailing wage laws.

•

In the Senate, Ives of New York will take Taft's place as head of the Labor Relations Subcommittee. It will make a big difference.

Taft and Ives usually were on opposite sides of key labor issues. Taft, for instance, favored voluntary approach to fair employment practices. Ives pushed a compulsory bill through the Senate Labor Committee last year.

Taft wanted the 80-day national emergency injunction to get a fair trial in the hands of an administration friendly to Taft-Hartley. Ives wanted to kill the injunction.

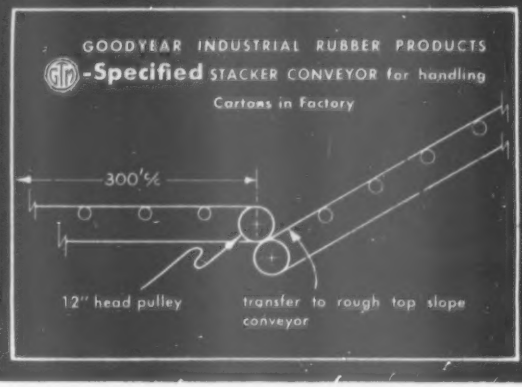
SEE PRACTICAL LABOR RELATIONS, PAGE 252

HERE'S PROOF—IT PAYS TO CALL IN THE G. T. M.

These two conveyor belts—handling cartons between rail platform and bottle shop, were real "problem children." The horizontal belt stretched badly, causing shutdowns for take-up adjustment or belt re-fastening as often as three times a month. Cartons riding up the slope conveyor would slip, slide back and cause jams at the foot of the climb, damaging the boxes.

So the plant operator called in the G.T.M.—Goodyear Technical Man—got his recommendations to end the time-consuming and costly problems. He studied the drive—recommended re-belting both conveyors. The horizontal belt is now a Goodyear Stacker Conveyor—the slope is belted with a Goodyear Rough Top. The troubles? Ended! The horizontal conveyor has served over two years without a take-up, without any stretch. The rough top conveyor ended back-slip completely.

Wherever a conveyor belt problem is concerned—redesign of an existing unit or specification of a completely new unit—it's only common sense to turn to the man who knows conveyors best. You can reach him by calling in the G.T.M. through your Goodyear Distributor or by writing:
Goodyear, Industrial Products Division, Akron 16, Ohio.



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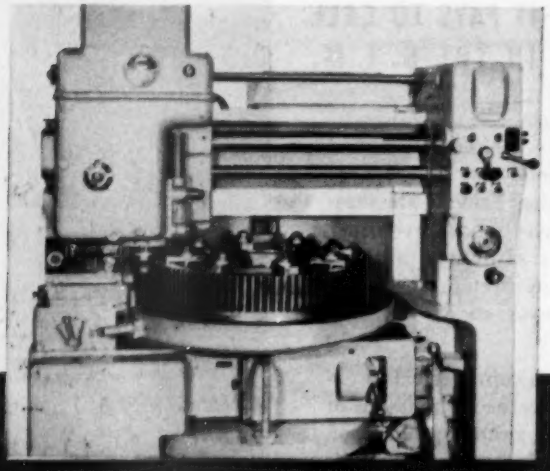
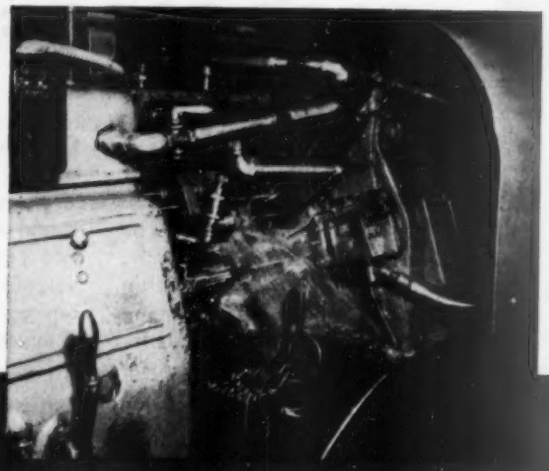
We think you'll like—THE GOODYEAR TELEVISION PLAYHOUSE—every other Sunday—NBC TV Network

UPS GEAR PRODUCTION 233% per cutter life. A well-known mining machinery manufacturer* gets this result by changing to *Texaco Sultex Cutting Oil*. Another benefit is fewer rejects.



DOUBLES LIFE OF TOOLS machining stainless steel. A prominent valve manufacturer* gains this benefit by changing to *Texaco Cleartex Cutting Oil*. Also reduces amount of oil used.



Do what these companies do to turn out more at lower unit cost

REDUCES OIL CONSUMPTION 74%. A large mid-western plant* is making this important saving by using *Texaco Regal Oil (R&O)* as its hydraulic medium. Machine maintenance costs are lower, too.

CALL THE NEAREST of the more than 2,000 Texaco Distributing Plants in the 48 States for Texaco Lubricants and Lubrication Engineering Service. The Texas Company, 135 East 42nd Street, New York 17, N. Y.

**Name on request*

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330 West 42nd Street, New York 36, N. Y.

CURTIS W. MCGRAW

1895 — 1953

EVERYBODY WHO KNOWS FACTORY has known Curtis McGraw, president and chairman of the board of the McGraw-Hill Publishing Company. The enduring mark of his leadership in the task of keeping business well-informed, shaping the technical development of industry, and holding the nation to an awareness of its power for greatness and goodness must remain on these pages. But it is something out of the lives of all of us that he died last month.

To quote from an editorial in the *New York Herald Tribune,* Sept. 11, 1953:

"Curtis Whittlesey McGraw, who died yesterday had presided with imagination and skill over the wide-ranging enterprises of the McGraw-Hill Company. Virtually his whole life was given to the work which his father had shared in founding. He was always ready to take part in civic enterprises, but the company itself is undoubtedly the memorial by which he would want to be remembered. As outward symbol of his contribution there stands at the west end of 42d St. the famous building designed by Raymond Hood, a landmark in the city. But in factories and industries without number there is some part attributable to the facts and information which poured forth through the enterprise of his company."

THE SAD CASE

Company X thought it had...

An Excellent Personnel Program...

...until it found its sound personnel policies were being "sabotaged" by first-line supervision. Here (below) are the background and (on following pages) a shocking report that brought swift remedial action.

NO MATTER HOW HAPPY YOU MAY BE with your personnel policies, you might get a rude shock if you knew how those policies *really* work out in practice. Few companies have taken the trouble to get a true picture, as the employee sees it—and to evaluate it. *Company X did.*

What Company X found was that its top-notch personnel and industrial relations policies and programs were being unwittingly sabotaged by first-line supervision. Mostly because supervision at even higher levels was not on guard against it. The "little" details were neglected in the incessant drive to get production out.

COULDN'T HAPPEN TO YOU? · That's what the industrial relations manager at Company X thought. His basic program was good enough to enjoy a national reputation. He was often invited to speak at large conferences. Turnover and absenteeism were in line with industry and area experience. Union relations were good.

HOW COMPANY X LEARNED THE FACTS · The industrial relations manager hired another staff man, fresh from earning his advanced degree at a leading school. It seemed like a good idea for him to get some of the "flavor" of the company's shop, and a firsthand knowledge of its employees as background for his new work—so he was told to take a shop job through the regular employment office. More as a matter of evaluating the reporting ability of the assistant than because he expected to learn much of anything new, the personnel manager asked him to file a report on his experience.

To avoid possible difficulties with either the union or supervisors, he was instructed:

1. Don't ask about or report on union doings.
2. Don't attend union meetings.
3. Otherwise, file a complete report on the operation of certain phases of the company's personnel program, indoctrination, safety, training, etc.

AN EYE-OPENER · The report shocked the personnel manager and the plant manager—the *only* people in the company who knew that the report was to be made. To this date, no one else in the company even knows of its existence.

REMEDIAL ACTION · How different is the situation at Company X today than it was a year ago when the report was made? We can't offer you any guarantees, because we haven't been able to repeat this assistant's experience. But just the fact that the personnel manager was willing to disclose this report — even on a don't-name-the-company basis — leads us to put a lot of faith in his statement that:

1. All of the *specific* weaknesses indicated in the report have been corrected.
2. The *upward* channels of communication have been strengthened, so that there is a much greater chance that future "unwitting sabotage" will come to the attention of top operating people before it gets to be general. Obviously, nothing is perfect—there will always be some weak spots. But Company X is now far better alerted to such dangers.

WHY WE PUBLISH THIS REPORT · Because the men behind it got such a shock — and believe that Company X benefited from it — they have made it available to FACTORY's readers. They said: "We feel sure that a careful audit of even the best personnel program, from the employees' point of view, but evaluated by a man trained to think in management's terms, will disclose at least a few serious weaknesses. And it might turn up a situation like ours. Undetected, it could have spelled serious trouble in a few years." —*The Editors.*

OF COMPANY X

This confidential report revealed ...

The Real Truth About Company X ...

***... as seen through the eyes of a new staff man —who first spent six weeks as a rank-and-file employee. This is what he wrote. No editing, except to delete the company's true name and to alter a few references to specialized operations that would identify the industry and possibly Company X itself (which is a leader in its industry). These disguises don't alter the substance of the report in any way.*—The Editors**

Indoctrination-Training These comments are made with the realization that it is easier to criticize than to operate without error. On the whole, I was impressed with the operations I encountered. Considering its bigness, and comparing it with other companies with which I have worked, I think the company ranks high. In themselves, the suggestions cover but a small part of the over-all set-up and should be considered in those terms.

OBSERVATIONS

1 • THE BRIEFING BY THE PLANT FOREMAN WAS IMPRESSIVE

Although short, the talk was very effective; it covered such points as reporting to work, shifts, unions, etc.

Stron points: Emphasis on (a) the new worker should expect the worst type of detail at the start; (b) the company is working *with* the union; (c) the employee should notify the foreman when he cannot report.

Weak points: (a) covers too many things to be remembered (about 20 major points); (b) easy-to-forget voice instructions.

The second briefing by the building foreman was not nearly as effective. It was much too short (about five minutes) and there was a tendency to rush through points.

2 • THERE WAS A DEFINITE LACK OF HOW-TO-DO-IT TRAINING

I received no instructions before starting work although I replied negatively to a question about whether I had operated a hand truck before. This caused some confusion and could have resulted in an accident.

After loading my truck I had to inquire from a member of another crew where to deliver the load.

On the first trip the truck fell between two steel ramps which appeared solid. It took three men to right the truck.

Another new man following me made the same mistake with the result his load spilled completely. Afterward, we were told which ramp to use.

On dumping a load the truck slipped back and cracked my shin; I was then told to keep my foot on it when unloading.

After about two hours on the job, a member of another crew showed me some tricks about handling the truck (loading it higher for tall men etc.).

3 • NO SAFETY TRAINING IS GIVEN PRIOR TO WORKING

Although the safety contest was mentioned, we received few, if any, suggestions on how to avoid accidents.

One new man in handling a heavy load lifted it in a way that could easily have caused a rupture.

This will be covered in more detail in the report on safety.

4 • SUPERVISION OF NEW MEN IS OFTEN NEGLECTED

This impression was also received by the other new men with whom I talked. It was the biggest surprise of the week.

Our foreman never told us what to do next, so we followed him around. One new worker carried

The Real Truth About Company X

Begins on page 84

his truck up and down the stairs three times before finding out what to do next.

Towards the end of the first day a new man rejoined our crew. When I asked why, he replied that the other crew was finished with their job and no one told him what to do, so he came to work with us. Some time later someone told him to go with another group.

We were told to report to a certain department. One of the crew led us to the receiving room. After waiting there about 20 minutes I asked if he was sure we were supposed to be there. The leader replied he wasn't sure but he thought someone would be around. A short time later a foreman appeared and put us to work.

Two of the men on our crew were absent one day for about an hour; as we had no foreman with us no one apparently was the wiser.

During the majority of the time I did not know who my immediate foreman was, either by name or by sight. I frequently asked the other new men and they agreed they rarely knew their immediate supervisor. On one occcasion we argued about who we thought he was!

5 • NEW MEN ARE RARELY TOLD WHY THEY ARE DOING SOMETHING

Although there were one or two good exceptions to this statement, we rarely knew more than the immediate job.

"Just make sure you keep the bin filled."

One exception: A foreman explained the whole process before assigning us to work. Most of the crew remarked favorably about it later.

6 • INDOCTRINATION BY THE PLANT MANAGER IS EXCELLENT

It fills a definite need and has the advantage of (1) showing the men top management is interested in them; (2) giving a brief history of the company and its products; (3) building esprit de corps.

This is time well spent and is basic to a good indoctrination program.

SUGGESTIONS

1 • IMPROVE THE INDOCTRINATION PROCEDURE

Indoctrination should be lengthened: It is difficult to grasp the twenty items (approximately) the foremen cover in about fifteen minutes. Effectiveness could be increased by:

Giving out handbooks covering essentially the same information. If these were in good form they probably would be taken home to the family. The current pamphlet is of questionable worth.

Having the foreman cover three or four items a day over a period of a week or more. This would have increased value of (a) allowing the worker to get the "feel" of his work and enable him to ask questions, and (b) permit a follow-up. Indoctrination should include a plant tour or plant description so the new worker will get the whole picture—research, products, processes, etc.

Indoctrination should stress employee purchasing of company products. Surprisingly, a number of men talked of family preference for other brands. Remedial measures might include (a) sending samples home with the men; (b) allowing purchases of company products at discounts, etc. (This latter point might reduce the amount of theft of products.)

2 • BETTER ON-THE-JOB TRAINING

The foreman should instruct the new worker in the special skills of the job together with the elements of safety.

Perhaps conferences for foremen would be profitable in developing a consistent method of handling such things as supervision, indoctrination, giving orders, etc. The new worker should be given closer supervision during the first few days of work to insure he gets off to the right start.

More emphasis should be placed on the WHY of doing a job.

Safety

In a plant that has gone for over a year and one-half without a lost-time accident, one would expect a very high standard of safety. I found this was true. Essentially, I was concerned with finding out *why* the safety program was effective.

There are two general accident factors: (a) factory (working conditions, etc.) and (b) personal. These will be discussed separately.

1 • SAFETY CONDITIONS IN THE FACTORY

Considering the degree of mechanization, working conditions in the plant are the safest of the four factories in which I have worked. Maximum protection is given around machinery; signs warn of all dangers; electric contacts are well protected, etc. In two weeks, I have found no device which I could classify as unsafe. I believe this is one of the major factors contributing to the good safety records.

One minor exception to the above concerns the goggles and masks that are issued. These may be the best on the market (I have no knowledge of this line) but they do result in some irritation to the eyes and nose. The goggles have a number of holes that allow dust to enter the eye. They may

be necessary to stop condensation, but some variation should be possible.

2 · PERSONAL FACTORS IN THE SAFETY PROGRAM

New men receive little or no safety instruction before starting work. Although the safety program is mentioned, no constructive references are made to working safety.

No lifting instructions are given either as to amount or technique, with the result that ruptures, sprained backs, etc., could result easily among beginners.

The vast majority of safety tips are received from fellow workers rather than from the proper authority—the foreman. The safety lecture does not fill all the requirements for which, I believe, it is intended. Although adequate in certain parts, and containing some valuable points, it leaves something to be desired.

Authorities generally agree the lecture method of teaching safety is not the best approach. Most maintain it should be the last resort. For example, such statements as the following (from the lecture) have little future value: "Lift with your knees and not with your back . . . The National Safety Council states 89½% of accidents . . . Watch for moving machinery."

It is a good question whether to use a worker to teach safety and sacrifice technique, or resort to a skilled instructor who perhaps might not have an intimate knowledge of the job. Some happy medium should be possible.

The attitude of new employees towards safety is not as good as that of older employees. There is far more horseplay among the younger men.

The attitude of foremen towards safety varies with the man. One foreman seemed very safety-conscious: he cautioned his men not to use a faulty outlet, sternly rebuked a crew for using water on a slide, etc. Other foremen, confronted with situations involving accident potential, said nothing. Some foremen could well adopt a "get tough" policy with new workers who flaunt safety rules.

The use of posters probably can be improved. The type of posters that are used in the plant are, for the most part, effective—probably more effective than we realize. Although at first skeptical as to their value, I found myself recalling the content of posters when in various situations. Example: Whenever I had my back to machinery the poster "My end is almost finished" flashed into mind. If my reaction is typical, perhaps posters are and should be a key to a good safety program.

The location and upkeep of the posters is not of the highest:

I have not seen a poster changed since my arrival. Some posters are in completely out-of-the-way places. (Example: In the lunchroom one safety poster is 30 feet from nearest worker; one is 10 feet from floor.)

Most posters are ill-kept, soiled, damaged, or covered with dust. Apparently they have been posted and then forgotten.

For maximum efficiency, assuming the posters have value (which I think they do), I think a definite policy should be formed for (a) procuring good, attractive, preferably humorous posters, (b) posting in prominent places, (c) constant changing and upkeep.

3 · THE SAFETY CONTEST

The contest raised a number of questions. It receives a good deal of emphasis; it is mentioned by all the supervisors in the indoctrination, and the portable radio (a contest symbol—Ed.) stands dusty at the entrance.

Obviously the contest has no direct influence on the men's activities. Its indirect value in terms of influencing the men's attitude towards safety, etc., is difficult to measure. It certainly has some merit and I would suspect, inasmuch as safety is such a difficult thing to get across, that it is worth the money spent. I would guess it has about as much merit for its effect on morale—making the men feel like a team—as it has on safety; both results are desirable.

The definition of "lost-time accident" as one which causes a man to miss work the following day, is an interesting if not debatable one. Apparently the men are encouraged to report for work on days subsequent to the accident even though they may not be able to do the work for which they were hired. The understanding is that they will be given a job with lesser requirements. Although this does have the advantage of keeping the man occupied, maintaining the family income, etc., it also results in decreased productivity and the cost must be assessed to the program.

The results of the contest so far, as I understand them, have two departments on top, with the others completely out of the picture as far as their chances of winning are concerned. It would seem the contest then would have little or no effect on these latter departments, except insofar as it advertises safety. Actually, it might react negatively, with the people concerned taking the attitude: Why care if we can't win? Although it may already have been considered and rejected, one suggestion might be to have individual contests among the departments. By using the previous year's record as the base, success might be measured in terms of improvement.

Turn the page

The Real Truth About Company X

Begins on page 84

Miscellaneous In the last two weeks, my job has been in the clean-up crew, in two different departments. As such, it has been difficult to talk with as many workers as before. The result is that the comments that follow are based upon the opinions of a fairly small number of men.

1 · THE HEALTH AND WELFARE PLAN

All the workers with whom I talked about this topic (one crew) were unanimous in their approval of the plan. In general, I found they had a good knowledge of its operation and were particularly sharp in comparing its cost with that of commercial companies. I regarded this as a very good sign inasmuch as this particular crew was very critical of many of the other company policies. If their attitude is typical, the health and welfare plan ranks high in the favor of the employees.

2 · LUNCHROOM FACILITIES

The reaction of the men towards the lunchroom facilities seems very favorable; this applies particularly to those who can conveniently use the main room. The food served by the cafeteria is highly praised both for quality and economy. The only adverse comments came about a month ago when the lunchroom was filled with flies. This was a seasonal thing, however, and was partly remedied by spraying.

Some of the men in one building did comment that their lunchroom facilities were inadequate. At the present time they are eating in a small room with one table. During warm days many of the men eat outside. However, during the winter I imagine they will be crowded. Although they could go to the main lunchroom most of them prefer to stay with their group.

3 · SHOWER AND LOCKER ROOM FACILITIES

Quantitatively, these facilities seem adequate. Everyone has two lockers and access to showers, etc. The men seem to think they have enough locker-room space. However, there is some adverse comment about the cleanliness. Some of the places are pretty messy. One of the men said he would hesitate to go to the toilet for fear of catching a disease; he did not appear to be the prudish type.

4 · COMPANY X VERSUS OTHER PLANTS

There is a good deal of comment, particularly among the new men, comparing the work at the plant with that of places previously worked. There is usually unanimous agreement that we offer more than other plants. The points that are brought out in favor of working for Company X are the better wages, more overtime, easier work, easier supervision, more "breaks," pay during the lunch period (a limited practice—Ed.) etc.

5 · FOREMEN TELLING THE WORKERS HOW THEY ARE GETTING ALONG

This practice is not the general rule here. In the six weeks at the plant only two foremen made any such comment. In talking with other new men, none said they had been told anything about their work, with the exception of the two mentioned.

Comments by the workers generally were in favor of hearing from their foremen. One new man mentioned he never knew where he stood. Although it is undoubtedly a minor point in the indoctrination program, I think a follow-up by every foreman would tend to instill a sense of confidence and belonging in the new men.

6 · RECRUITMENT

Finding out how the men pick Company X was difficult. With the high cultural-nationality similarity it could probably be assumed friends provide much of the information. A small number of men said they learned of job openings through United States Employment Service.

7 · COMPANY RECREATIONAL ACTIVITIES

Apparently the men are well informed about their extent. Many commented on the basketball team, bowling, soft-ball, etc. The impression I gathered from rather limited conversations was that the workers are pleased with the set-up.

A bowler said he thought the bowling teams were run as they should be with the company giving a fair support. The company picnic and occasional dance were mentioned as being good affairs. The fact that these activities are sponsored by the recreational committee (or so I was told) probably adds to the support given them by the men.

8 · SERVICE PINS AND PLANT NEWS BULLETIN

I never found the opportunity to discuss the service pins with any of the men. However, one thing impressed me and that was the sincere feelings the older men have towards the company and their fellow workers. This surprised me for I had never appreciated its extent until I had talked with a few of the men who were close to retirement. I can readily see where service pins, reunions, etc., have a definite place.

Inasmuch as I never received a plant news-bulletin (perhaps none was published), and never heard it mentioned by any of the workers, I am unable to pass on any comments about it.

Foremen's Pay Differentials

DIFFERENTIAL ↓	HOURS PAY PER WEEK								
	40	42	44	46	48	50	52	54	56
1%	175.0	183.8	192.6	201.3	210.1	218.8	227.6	236.3	245.1
2	176.8	185.6	194.5	203.3	212.2	221.0	229.8	238.7	247.5
3	178.5	187.5	196.4	205.3	214.2	223.2	232.1	241.0	250.0
4	180.3	189.3	198.3	207.3	216.3	225.3	234.3	243.4	252.4
5	182.0	191.1	200.2	209.3	218.4	227.5	236.6	245.7	254.8
6	183.7	192.9	202.1	211.3	220.5	229.7	238.9	248.0	257.2
7	185.5	194.7	204.0	213.3	222.6	231.8	241.1	250.4	259.7
8	187.2	196.6	205.9	215.3	224.6	234.0	243.4	252.7	262.1
9	188.9	198.4	207.8	217.3	226.7	236.2	245.6	255.1	264.5
10	190.7	200.2	209.7	219.3	228.8	238.3	247.9	257.4	266.9
11	192.4	202.0	211.6	221.3	230.9	240.5	250.1	259.7	269.4
12	194.1	203.8	213.5	223.3	233.0	242.7	252.4	262.1	271.8
13	195.9	205.7	215.5	225.2	235.0	244.8	254.6	264.4	274.2
14	197.6	207.5	217.4	227.2	237.1	247.0	256.9	266.8	276.6
15	199.3	209.3	219.3	229.2	239.2	249.2	259.1	269.1	279.1
16	201.1	211.1	221.2	231.2	241.3	251.3	261.4	271.4	281.5
17	202.8	212.9	223.1	233.2	243.4	253.5	263.6	273.8	283.9
18	204.5	214.8	225.0	235.2	245.4	255.7	265.9	276.1	286.4
19	206.3	216.6	226.9	237.2	247.5	257.8	268.1	278.5	288.8
20	208.0	218.4	228.8	239.2	249.6	260.0	270.4	280.8	291.2
21	209.7	220.2	230.7	241.2	251.7	262.2	272.7	283.1	293.6
22	211.5	222.0	232.6	243.2	253.8	264.3	274.9	285.5	296.1
23	213.2	223.9	234.5	245.2	255.8	266.5	277.2	287.8	298.5
24	214.9	225.7	236.4	247.2	257.9	268.7	279.4	290.2	300.9
25	216.7	227.5	238.3	249.2	260.0	270.8	281.7	292.5	303.3
26	218.4	229.3	240.2	251.2	262.1	273.0	283.9	294.8	305.8
27	220.0	231.1	242.1	253.2	264.2	275.2	286.2	297.2	308.2
28	221.9	233.0	244.0	255.1	266.2	277.3	288.4	299.5	310.6
29	223.6	234.8	246.0	257.1	268.3	279.5	290.7	301.9	313.0
30	225.3	236.6	247.9	259.1	270.4	281.7	292.9	304.2	315.5
31	227.1	238.4	249.8	261.1	272.5	283.8	295.2	306.5	317.9
32	228.8	240.2	251.7	263.1	274.6	285.0	297.4	308.9	320.3
33	230.5	242.1	253.6	265.1	276.6	288.2	299.7	311.2	322.8
34	232.3	243.9	255.5	267.1	278.7	290.3	301.9	313.6	325.2
35	234.0	245.7	257.4	269.1	280.8	292.5	304.2	315.9	327.6
36	235.7	247.5	259.3	271.1	282.9	294.7	306.5	318.2	330.0
37	237.5	249.3	261.2	273.1	285.0	296.8	308.7	320.6	332.5
38	239.2	251.2	263.1	275.1	287.0	299.0	311.0	322.9	334.9
39	240.9	253.0	265.0	277.1	289.1	301.2	313.2	325.3	337.3
40	242.7	254.8	266.9	279.1	291.2	303.3	315.5	327.6	339.7
41	244.4	256.6	268.8	281.1	293.3	305.5	317.7	329.9	342.2
42	246.1	258.4	270.7	283.1	295.4	307.7	320.0	332.3	344.6
43	247.9	260.1	272.6	285.0	297.4	309.8	322.2	334.6	347.0
44	249.6	262.1	274.6	287.0	299.5	312.0	324.5	337.0	349.5
45	251.3	263.9	276.5	289.0	301.6	314.2	326.7	339.3	351.9
46	253.1	265.7	278.4	291.0	303.7	316.3	329.0	341.6	354.3
47	257.8	267.5	280.3	293.0	305.8	318.5	331.2	344.0	356.7
48	256.5	269.4	282.2	295.0	307.8	320.7	333.5	346.3	359.2
49	258.3	271.2	284.1	297.0	309.9	322.8	335.7	348.7	361.6
50	260.0	273.0	286.0	299.0	312.0	325.0	338.0	351.0	364.0

Easy-to-use table helps you maintain a proper relationship between workers' pay and foremen's salaries

DIFFICULTY IN COMPARING hourly rates and monthly salaries often obscures the all-important differential between a foreman's salary and his men's pay.

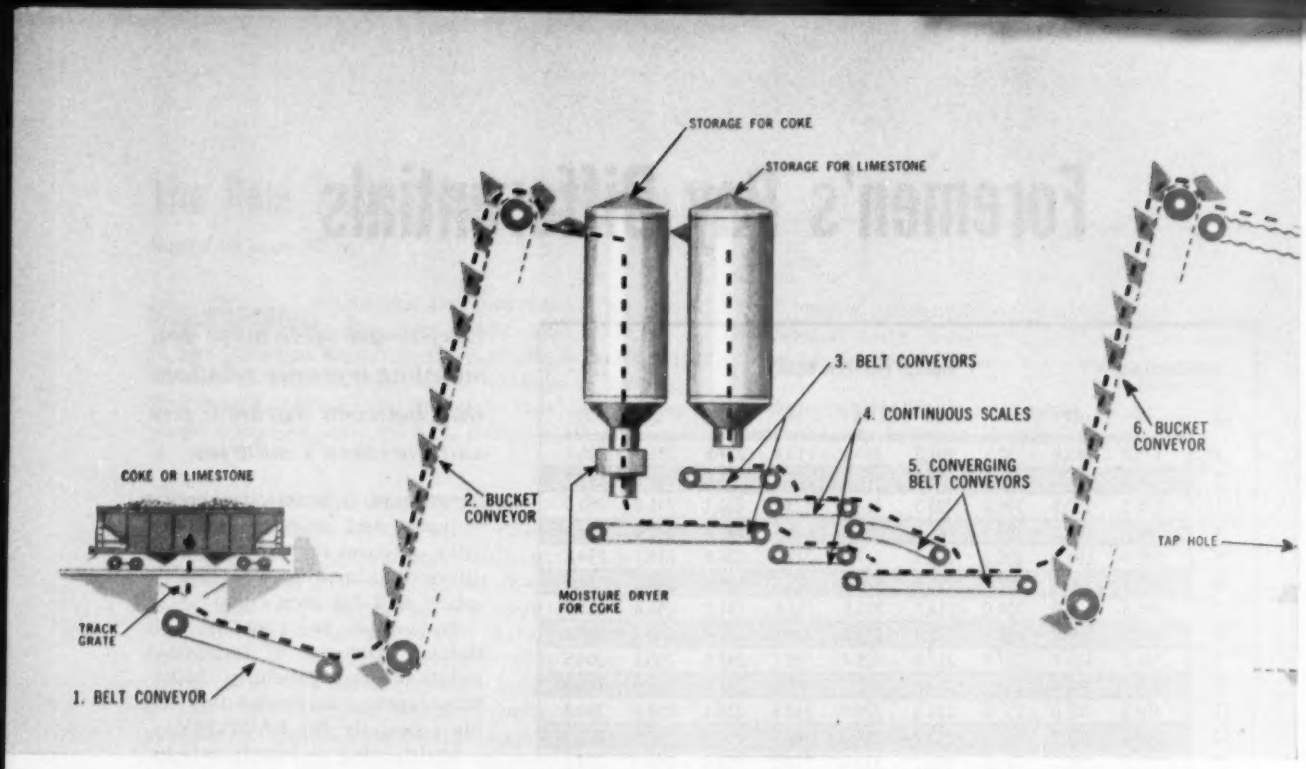
To simplify the problem, Lee Belcher, Director of Industrial Relations for Pillsbury Mills, Minneapolis, developed this table especially for FACTORY.

Multiplying an hourly rate by the factors given will result in a monthly salary for any desired differential. You can even take overtime into account—but don't forget that the columns are marked for number of hours pay.

For example · You want the foreman's salary to be 15% above the earnings of the highest-paid man he supervises (say $2 an hour). The men are working 44 hours, with time and a half for the last 4 hours—that's 46 hours pay. From 15%, read across the table to the column headed 46 hours. You'll find 229.2. Multiplying by $2 gives you a monthly salary for the foreman of $458.40.

Or, you may want to find out if your present differentials are inconsistent from one department to another. Divide foreman's salary by top hourly rate in department (say, $400 by $2). If the men are averaging 44 hours' pay, read down that column and find the factor closest to 200. This will be 200.2. Reading across to the left, this will give you 5% as the differential.

Your actual rates probably won't come to a nice round number like $2. With a figure like $1.575 you can't do the arithmetic in your head, but it works the same way.



SCHEMATIC DRAWING SHOWS FLOW OF MATERIALS THROUGH NATIONAL CARBIDE'S NEW PLANT. KEY TO PROCESS IS...

Switch to Continuous Processing

By RICHARD J. NIEBANCK
Technical Assistant to the President
National Carbide Company
Division of Air Reduction Company, Inc., New York

Sure, this is a carbide and acetylene plant, and you don't make either. But this isn't a story about how to make carbide or acetylene. It's the story of how National Carbide engineers took a step toward the "Factory of the Future" when they planned their new plant at Calvert City, Ky., why they did it, how they did it, what problems they faced, how they solved them—and what they got out of it.

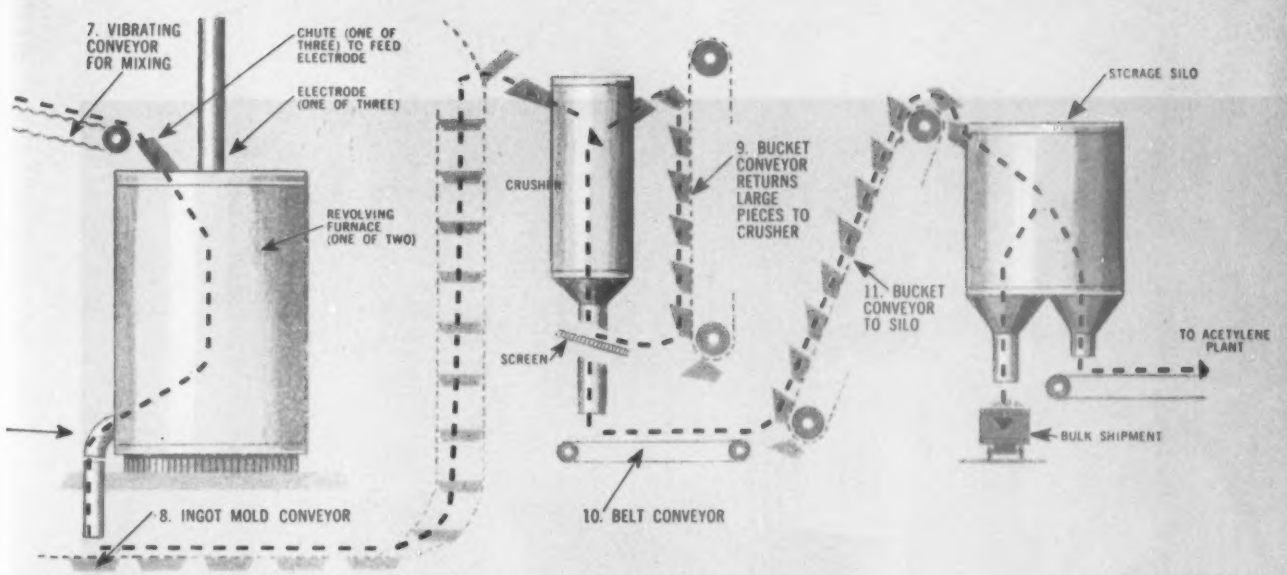
—The Editors

THE HUGE TONNAGES of demand for calcium carbide and acetylene pointed to one conclusion for us at National Carbide Company:

We needed a large modern "factory of the future." Our engineers determined that this new plant must be modern in every respect. It must be located strategically as to power availability, raw material sources, railroad and water transportation. It must be located favorably as to markets with ample surrounding land area to permit the most economic distribution of product by direct bulk shipment of carbide and pipe-line delivery of acetylene. It must provide for future growth. It must be designed to provide the best working conditions and production efficiencies.

Our Answer: A New Kind of Plant

In the design of the physical plant itself, we started out with just one fundamental idea:—to thoroughly evaluate all old and new concepts of calcium carbide and acetylene manufacture and emerge with a plan of process, plant, and operation that would (1) minimize capital investment and operating charges; (2) produce a quality product at a price that would meet the economic requirements of end



...CONTINUOUS-PROCESS FURNACE (ABOVE) WHICH SUGGESTED AUTOMATIC HANDLING AND AUTOMATIC CONTROLS

Slices Operating Costs

use markets; and (3) provide working conditions satisfactory to our employees and the adjacent industrial community. So we did these things:

1. We installed continuous-process furnaces. Our engineers realized that continuous flow made lots more sense than conventional batch furnaces that have to be tapped periodically. They also decided to make the furnaces several times larger than conventional ones.

2. We built our materials handling around the furnaces. The continuous-tap furnace led to our design for continuous flow of raw materials.

Continuous tapping also suggested the possibility of taking the molten carbide away for cooling continuously, instead of in the large ladles used with the batch furnaces. An ingot-mold conveyor on which the carbide would solidify as it was carried away was our answer.

Combining the production of several conventional furnaces, arranged in a horizontal line, into one large modern furnace, with a greater vertical height, led to the need for more vertical automatic handling of raw materials and product.

3. We installed automatic controls. We needed them in our continuous production set-up. If one unit breaks down, all the units ahead must also shut down. Automatic controls do the job. Light and horn systems warn operators when manual changes have been made.

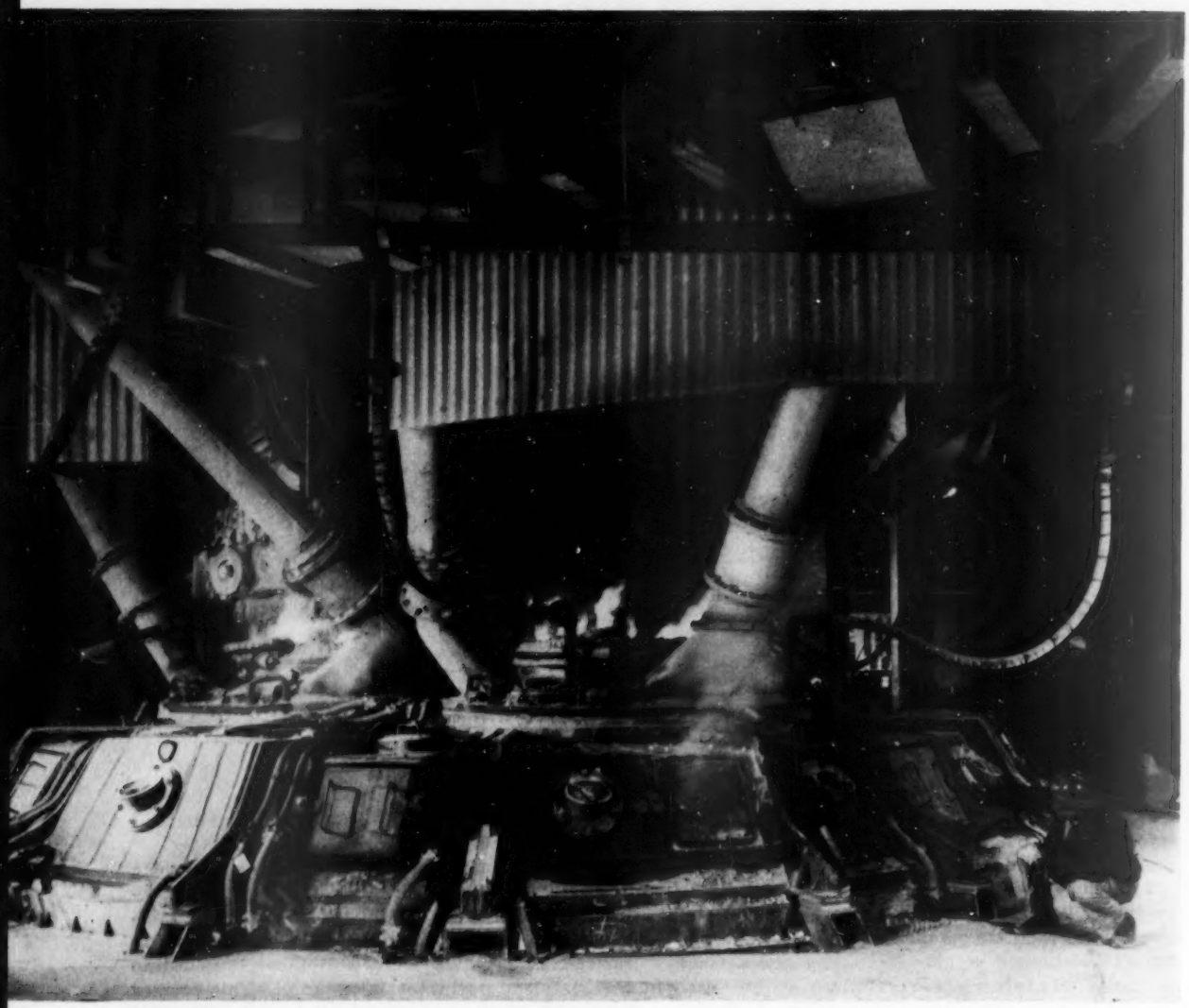
4. We designed and built continuous acetylene generating facilities. All of the same general features of mechanized handling and automatic controls that were introduced into the carbide furnacing operation were also incorporated into the acetylene generator installation. This facility provides means by which acetylene is produced for direct pipe-line delivery.

We Increased Productivity . . .

. . . BY MORE EFFICIENT USE OF POWER

We have a very heavy demand charge. So anything we could do to get our actual load up to demand would save money. And that's just what the furnaces do. Here's how:

- No shutdowns for changing electrodes. Our specially designed electrodes are continuously produced and added to one end as the other end is consumed in the process.
- "Peak eliminators" prevent our furnaces from drawing more power than a previously determined maximum. (These eliminators measure the cur-



CONTINUOUS CHARGING of limestone and coke into top of electric furnace is necessary for continuous processing. Conveyors carry raw materials from storage, through weighing and mixing, to enclosed chutes feeding furnace.

rent to the electrodes. If it exceeds a predetermined limit, the unit reduces the amperage to keep the power used near a constant. This also keeps the average load factor close to demand.)

• Special round-shaped furnaces and delta-pattern electrodes have more uniform heat distribution than the rectangular-shaped furnaces and in-line electrodes used in batch furnaces. The new set-up permits more compact arrangement.

. . . BY MORE EFFICIENT USE OF RAW MATERIALS

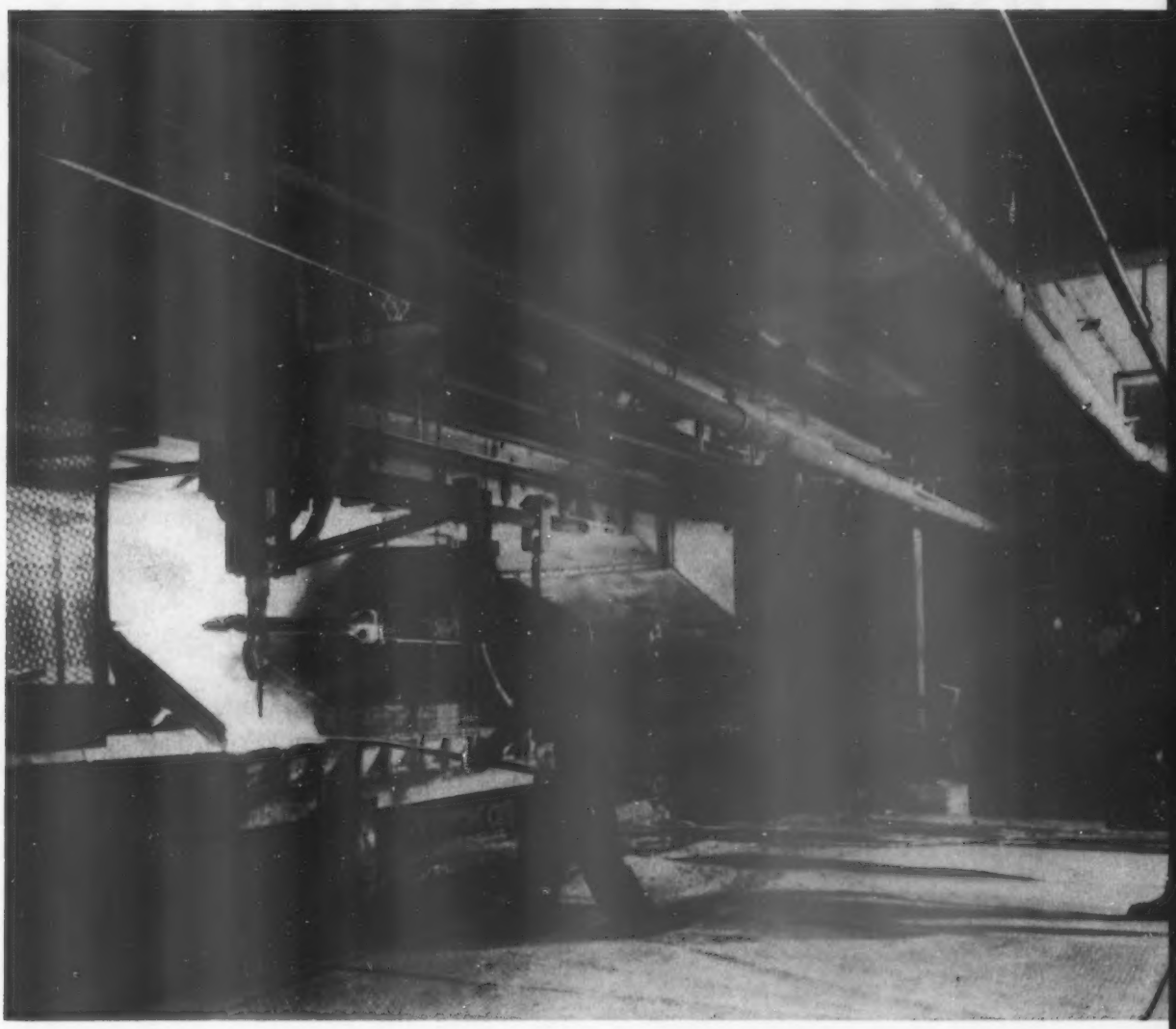
Again, it's the large round rotating closed-top furnaces that can be expected to do the trick, as compared to the smaller open-hearth conventional types. Large furnace installations of our modern design inherently embody characteristics by which raw materials otherwise lost to the atmosphere are retained to make additional product.

That's not all. Valuable offgases are preserved for by-product uses.

. . . BY MORE EFFICIENT USE OF PERSONNEL

The physical plant and process were designed to incorporate such mechanical and automatic equipment as would tend to eliminate as many manual functions as possible.

This affords the plant personnel a better opportunity to use brain rather than brawn.



CONTINUOUS TAPPING of molten carbide keeps production moving. Carbide flows into chill molds attached to an endless chain conveyor. It solidifies as conveyor carries it to and dumps it into a storage silo ahead of crushing.

Here's how our manpower needs have changed as we made the switch from batch to continuous production:

- We need fewer people in furnace labor, materials handling, mechanical maintenance, and supervision. Mechanization is the reason.
- We need more people in furnace control, electrical maintenance, and maintenance stores.
- We need greater skill from everyone.

Where did we get our supervisory and technical staff to operate the plant? We got just about all of these people from our other plants. Our operators were drawn from the local labor force and given extensive training.

Our maintenance help consists of local people with experience, and men from the labor force of the contractor who built the plant. These men, in process of building, became experienced enough in our installation to be of great value.

We Have Plans for Expansion

A third and fourth carbide furnace now being installed will double capacity. A fifth and sixth are being considered. Each pair of furnaces will have its own materials handling and control systems. The acetylene generating facility is arranged to satisfy growth in demand for direct pipe-line delivery.

IDEAS OF THE MONTH *for*

By LEWIS K. URQUHART • Managing Editor, FACTORY

PALLETIZED SHIPMENTS can save your customers unnumbered man-hours of unloading time. For instance, Monsanto Chemical Co. (St. Louis 4), is shipping phthalic anhydride in 28-bag units built up on an expendable fiberboard sheet. Layers in each unit, interlocked pinwheel-fashion, are glued bag-to-bag. Result is an extremely stable unit that can be handled with a fork truck. A car loaded in this way can be unloaded by two men in about two hours. Normal hand unloading takes three men about five hours.

WIDE SCREEN SYSTEM with stereophonic sound for 16mm movies has been announced by Bell & Howell (7100 McCormick Road, Chicago 45). It's patterned after 20th Century-Fox's CinemaScope. A single anamorphic or "squeeze" lens attachment is used both for shooting and projection.

BOOKLET OF THE MONTH—is "Gadgets," issued by du Pont's Petroleum Chemicals Division (Wilmington 98). It's an unusual collection of evidence of the way people in a company go about solving some of their operational headaches and safety problems.

NIFTIEST CLOTHES STORAGE UNIT we've seen is a portable job made by Lyon Metal Products, Inc., Aurora, Ill. Overhead lockers. Then clothes hangers. Worker secures coat by dropping chain through sleeve, then locks chain in position in slot in door. With door locked, coat is secured.

BARREL-TYPE DEGREASER (Baron Industries, Los Angeles) cleans parts rapidly in non-flammable trichlorethylene vapors, is easily moved from job to job. Needs only 5 gal. of cleaning solvent. Dirty solvent is automatically reclaimed by an air-cooled condenser, which also controls vapor height.

GRAPE ARBOR is what GE calls its J-47 jet engine production line at Cincinnati—because the engines hang from an overhead conveyor. Proof, if you need it, that size of product doesn't limit choice of handling equipment.

SKY-PARK enables you to double-park vertically. It has a central column with a car platform on each side. Within 30 seconds, either hydraulically or mechanically, it lifts two cars into the air, leaving room to park two more underneath. About $2500. Simmons Industries, Inc., Albany, N. Y.

DUNNLEW is a plastic developed by a tool engineer and a plastic tool foreman at Boeing Airplane Co., Seattle. They use it in making joggle dies. Two production dies recently were made in 80 and 86 hours respectively. Compare those figures with the average time of 250 hours required to fabricate the same die from steel!

3-D MOVIES FOR INDUSTRY are promised by RCA's new portable 16mm arc projectors with selsyn interlocked motors. Audience uses polarized glasses—just as at their favorite movie. RCA Engineering Products Dept., Camden.

Factory Executives

COLD FEET? Benjamin Electric Mfg. Co., Des Plaines, Ill., will sell you a pair of electric socks at $19.95. For hunters, skiers, football fans. But why not for the plant with a cold spot that can't be helped?

NEWEST AIR TUBE SYSTEM, designed by Lamson Corp., Syracuse, N. Y., needs no operator, no central desk, no complicated circuits. Yet it services as many as 200 stations and will handle up to 600 carriers per hour. Dial the correct number in a carrier—and off it goes to any station in your system.

PARKING POSTS (which you can get from Enterprise Industries, Inc., Streator, Ill.) plus wood timbers (from the nearest lumber yard) will help you hold your parking lines. Can be installed with anchor bolts on the ground or any parking surface.

IF YOU'RE USING A DESICCANT to protect shipment from corrosion or mildew, you'll want to know about a new non-woven fabric bag that "breathes." Wellington Sears Co., 65 Worth St., N. Y. C., distributes the fabric—which is made from cotton fibers and a Geon vinyl plastic latex. B. F. Goodrich Chemical Co., Rose Building, Cleveland.

SLIDERULE PENCIL is for the well-dressed engineer who doesn't like to go places without a slipstick. Writes in two colors. Has a collapsing measuring scale, depth gage, detachable ruling edge, concealed eraser and spare leads, plain and enlarging cursor for the sliderule's nine scales. $4.98. Device Development Co., 226 W. 4th St., New York 14.

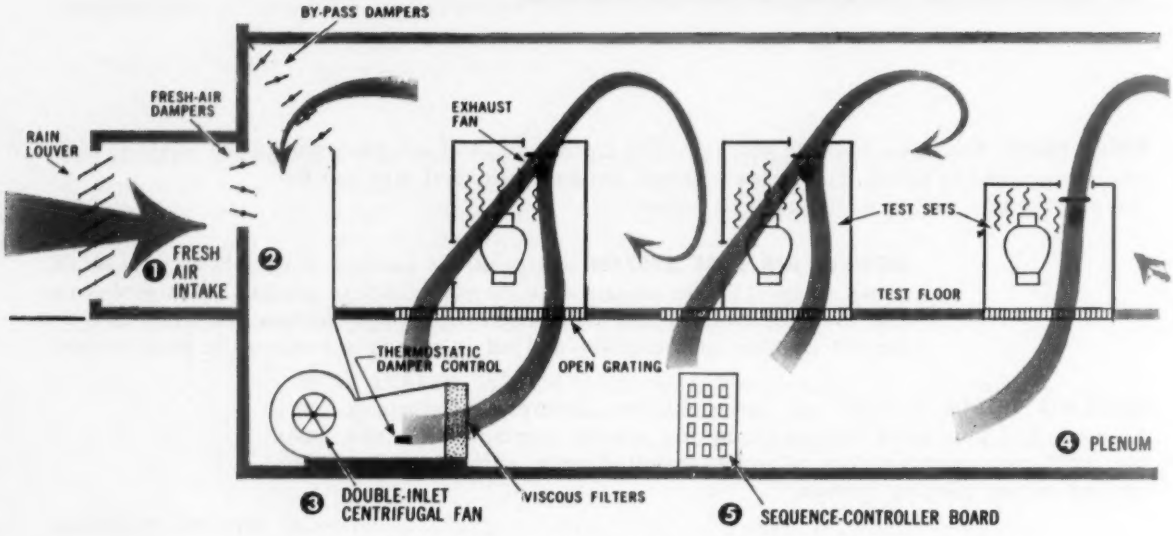
XDUCT is steel conduit whose surfaces are covered with an aluminum enamel that cuts down the friction caused when fishing a wire through. In 10-ft. lengths, in diameters from ½ in. to 6 in. National Electric Products Corp., Gateway Center, Pittsburgh.

SPECIFY SERIAL NUMBER of your machine every time you order repair parts. That's good advice from Gisholt Machine Co. (1245 E. Washington Ave., Madison 10, Wis.) which knows something about the frustrations and delays caused by failure to include the one piece of information that will enable the manufacturer to pinpoint the specific machine you're talking about.

LAB GOWNS of spun lead seem to be what the doctor ordered for radiologists, technicians, and inspectors who need protection from x-rays and beta radiation. The Archer gown (for Dr. V. W. Archer of the University of Virginia Hospital) is made by Bar-Ray Products, Inc., 209 25th St., Brooklyn.

MOVING COSTS PLENTY. Especially if it involves shutdown and lost production. It means neither for Davis & Geck, Inc., a subsidiary of American Cyanamid Co. D & G will take a year to move from Brooklyn to Danbury, Conn. (about 75 miles) and won't lose an hour of production during the transfer.

This ventilation system cools the plant in summer



In winter it...

Utilizes Waste Process Heat to Knock $12,000 Off the Fuel Bill

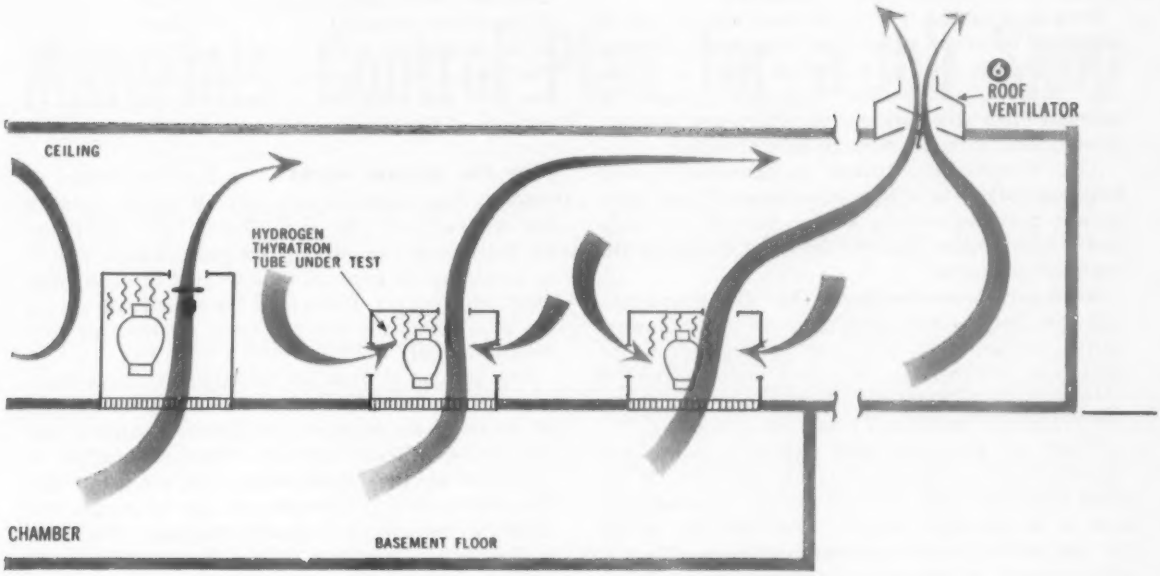
By ANTHONY SCALA
Secretary-Treasurer and General Manager
Chatham Electronics Corporation, Livingston, N. J.

PROBLEM • We have to get rid of as much as 8-million Btu's per hour generated in a working area about one-sixth the total floor area of our plant.

This amount of heat is generated in the electronic testing of our produce, hydrogen thyratron tubes. Most of the energy of the 3000-kva. connected electrical load used for this testing is dissipated into the air as waste heat.

The problem is to remove this waste heat at varying test-load conditions, at all seasons of the year, without creating undue temperature variations leading to employee discomfort. Also the temperature rise in the test sets themselves is limited to about 15 degrees F over ambient air temperatures because of the delicate nature of the electronic test apparatus. Nor is open-air testing feasible. (Moreover this limited rise precludes the use of water-cooled heat exchangers for waste-heat recovery.)

Ours are round-the-clock operations. Our plant —a new one—was just recently designed by our consulting engineers (Engineers Incorporated, Newark) for our special operations. It's a single-story, steel-frame building. Sidewalls are brick and continuous sash. The plant is 500 feet long by 200 feet wide, with 16 feet inside headroom. It has a steel roof deck covered with 1 inch of board insulation under a 20-year-bond flat roof.



The hot testing operations occupy a middle portion of the plant for about one-third its length and extending from one sidewall to about the center of its width. In this area are 90 test sets ranging in kilowatt capacities from 4.2 to 101.0. About 90% of the test heat is given off by 38 large test sets of 63- and 101-kw. capacity. Technicians must stay close by these test sets to operate electronic controls and take readings.

Any air used to ventilate or cool the test sets has to be clean. Otherwise accumulated dust or grime would damage the delicate components and also cause false test readings.

Obviously all excess heat has to be removed from the test area in all kinds of weather, summer or winter. But we felt we could salvage much of this to heat the rest of the plant during cold weather. On a zero day our plant requires about 6½-million Btu's per hour to heat it comfortably.

SOLUTION • We asked our consulting engineers to solve our problems in their original design of plant and facilities. They came up with a scheme of controlled ventilation coupled with automatic control of intake air and recirculation of indoor air.

This installation had its first test this summer. It is meeting all requirements of reasonable worker comfort and maximum equipment temperatures. And we estimate a saving of $12,000 in heating fuel we won't need because of re-use of excess heat for heating the plant in colder weather.

WHAT THE SYSTEM IS • The schematic cross-section (elevation) of the test department shows you the main features of the heating and ventilating system. This section cuts across the length of the building. The roof ventilator (extreme right) is about 110 feet beyond the nearest test set.

Here are the major components, identified by letters on the cross-section diagram:

Fresh-Air Intake (1) • This shed-like structure extends along the west side of the building for a length of about 150 feet. It's about 6 feet wide, 9 feet high. Air enters the louvers and passes through to the automatically controlled damper system.

Intake Duct (2) • This extends an equal distance along the inside of the building. It feeds fresh air from the intake shed down to a group of blowers located inside the duct at the basement level. Along its entire length is a series of sectionalized bypass dampers. Each section is automatically and independently controlled. These and all other system dampers are actuated pneumatically.

Air Blowers (3) • There are seven 25-hp., double-inlet, centrifugal blowers spaced evenly along the inside of the basement intake duct. Total capacity is about 350,000 cfm. These blowers discharge through individual duct outlets equipped with high-velocity viscous filters (cleanable) to remove all dust.

Inside each duct outlet is a thermostatic control. It regulates the volume of air circulation in the plant by controlling the movement of three

damper systems—at the fresh-air intake (1), the bypass dampers, and the roof ventilator (6).

Plenum Chamber (4) · All seven blower outlets discharge into one large basement plenum chamber under the test area on the grade floor. Air from this chamber, under positive pressure, passes up through open steel grating on which test sets are located, and then on through to the ceiling.

The blowers are spaced to correspond with building bays—two in each bay—so that each blower provides cooling air for four to five large test sets and many smaller ones, all in direct line with the fan outlet.

Sequence-Controller Board (5) · This board controls the starting and stopping of all seven blowers so that the input of cooling air corresponds to the heat load. Known as a Modutrol motor controller (Minneapolis-Honeywell), it starts any one of the seven blowers as soon as a test set gets going.

When the electrical load (which is equivalent to heat load) in any one bay exceeds 50% of the total possible load, the controller automatically cuts in the adjacent blower. This controller works on the principle of electrical resistance. Thus it will respond to whatever test power load is being used. When test power in any bay drops below 50%, the second blower is automatically cut out.

The sum of this is that the sequence controller supplies the right amount of air in that section of the plenum where it is needed. It automatically turns on one to seven blowers as they are needed, or turns them off as the test load falls.

Roof Ventilator (6) · This is a damper-controlled, gravity-type (Swartwout) which runs as a continuous opening along the roof for about 150 feet, paralleling the length of the intake system. It is provided with sectional dampers, which are controlled by the thermostats in the blower outlet ducts.

Purpose of this ventilator is twofold. It draws hot air from the test area across the width of the plant. It removes unwanted hot air. Because of positive pressure, the hot air also drifts lengthwise through the plant. Power ventilators spotted elsewhere in the roof help pull and circulate the hot air to all corners of the plant.

HOW THE SYSTEM WORKS · Fresh air is drawn in through the intake louvers (1). It passes through the intake duct (2) and blower (3). After the air is cleaned and discharged into plenum (4), it is drawn up by exhaust fans located in each large electronic test set. From here the air spreads across the plant, and out into the open air through roof ventilator (6).

The volume of fresh air, hence plant indoor temperature, is controlled by automatic interaction of the fresh-air dampers, the bypass dampers, and the roof-ventilator dampers. This interaction is regulated by the thermostatic controls inside the fan outlets at (3). Enough fresh air is always admitted to maintain a minimum temperature of 70 F in the air in the plenum below the test floor.

On a very cold day, for example, the fresh-air dampers and roof-ventilator dampers are shut. The bypass dampers are open. This causes almost complete recirculation of plant air from the ceiling back down into the intake duct, then again into the plenum chamber and up through the floor.

On a hot day both fresh-air dampers and roof-ventilator dampers are wide open. (They always act together.) The bypass dampers are shut. All the incoming fresh air is needed to cool the test sets and is exhausted outdoors as waste heat.

On a mild spring or fall day, the various dampers modulate to maintain a fairly constant and comfortable indoor temperature. Thus the automatic controls meet any operating or weather situation.

LISTENING to amplified sound of burnishing helps hold close tolerances.

Amplified Sound Cuts Scrap

HOW MUCH METAL is being removed by your burnishing machines? You can tell by the volume of sound. But you can tell better if you amplify it, says Minneapolis-Honeywell's aeronautical division, Minneapolis. Its home-made "stethoscope" has:

- Practically eliminated scrap by minimizing overshooting of tolerances.
- Speeded set-up time by about 50%, production time by 10%.
- Reduced operator fatigue by enabling him to sit comfortably and monitor the operation, rather than lean over or strain to hear outside noises.

THE HOOK-UP · Just fasten the mike to fixture that holds the part under the burnishing wheel. Amplifier and earphones (or speaker) are then connected. You can buy the whole works from your radio parts dealer for about $50.

Materials Control Plan for a Job Shop

This simple, low-cost program really paid off for Specialty's job shop. Covers everything from checking purchase orders to salvaging defectives.

By S. EISENBERGER, Plant Manager
Specialty Engineering Division
Specialty Assembling & Packing Company, Brooklyn

A SAVING IN MATERIALS of 2% at Specialty is equivalent to a 10%-16% cut in direct labor costs. That's because many of our electronic components and assemblies cost five to eight times as much as direct labor. We went after—and got—such savings with our materials control program. And picked up these added benefits:

- **Supervisors became more conservation-conscious,** learned more about costs and how to cut them.
- **Unexpected parts shortages were eliminated.** No time wasted in requisitioning materials or taking inventory, either.
- **No "hoarding" to worry about.** Foremen no longer kept hidden stores of materials that were uncovered too late to do any good on the job.

SURE SIGNS OF POOR CONTROL • When one or more of these three symptoms are evident, it's time to think about better materials control:

1. **You often can't complete units because any one of several hundred parts is missing.** That costs you plenty—in idle facilities, higher supervisory costs, and re-handling of partially assembled units.
2. **You try to insure adequate parts supplies by accumulating big inventories.** This remedy is worse than the disease it cures. The interval between delivery of the first and last item might easily be three months or more. On extended jobs, some parts can remain in your plant for more than a year before use. That means you have to maintain an inventory out of all proportion to shipments.
3. **You have lots of trouble with unbalanced inventories**—too many of one part, not enough of another. No one can make accurate allowances for shrinkage. Furthermore, some components are of such a nature that the vendor must be allowed to make a reasonable over-run. Result is, the quantities that will be delivered can't be known exactly in advance. So it's no trick to wind up with an excess inventory of 5% or more—of which a large proportion is unbalanced.

Even when procurement is close by, unbalance can upset production schedules. You don't know what parts will be in short supply. They may require a lead time of 14 weeks. Or have heavy set-up charges.

OUR SPECIFICATIONS • To minimize these problems, we set up the following specifications for our materials control plan:

- **Low operating cost.** We wanted a program that yielded the biggest spread possible between the savings obtained and the cost of control.

Our program gives us that. In our plant, purchasing almost $3-million worth of parts annually, one clerical worker is adequate to handle all record-keeping. This represents no increase in office staff for us.

- **Flexibility.** We wanted a plan that would permit emergency measures to meet emergency situations. We knew that poorly designed systems can put production in a strait-jacket. Red tape, errors, and delays can defeat the very purpose of the system.

Our system tracks inventory and rate of shrinkage continuously, and causes proper action to be taken in time to meet production schedules. It allows our purchasing department to work close to theoretical requirements, yet warns when to make necessary adjustments to avoid excessive costs and delivery delays.

- **Simplicity.** Complicated programs are expensive to install, require a major educational effort, and continually tempt evasion.

Our program is easy to operate and understand. This helped make it readily acceptable to supervisors and top management. We have a separate materials control department under a full-time supervisor. He reports directly to the plant manager. He's a top man who has no other duties. If he does his job right, he'll more than pay his way. Smaller plants may be able to combine stockroom and materials control functions.

Turn the page for detailed report on paperwork used with this plan

JOB NO. 280 — PURCHASE ORDERS

DATE	P.O. NO.	QUANT.	DEL. SCHEDULE	UNDELIVERED BALANCE			
4/20/53	06248	3000	600/WEEK	2628	2218	1678	
			BEG. 6/15/53				

STOCK RECORD

DATE	NO.	REC'D	TRANSF.	ISSUED	STOCK BALANCE	DATE	NO.	REC'D	TRANSF.	ISSUED	STOCK BALANCE
6/23/53	10453	372			372	7/2/53	10540	540			1022
6/24/53	1173			372	0	7/6/53	1365			300	722
6/25/53	RW462	372			372	7/8/53	M.T.	6			728
6/30/53	10486	410			782	7/9/53	1382			6	722
6/30/53	1291			300	482						

PART NO. E-6 — DESCRIPTION POWER TRANSFORMER — REVIEW POINT 600 — NO. UNIT 1

1

JOB NO. 280 — ITEM # E-6 — ITEM POWER TRANSFORMERS — R 10453

DATE 6/19/53 — P.O. # 06249 — DWG. NO. 442-4

REC. FROM HARVEY, GOODSON & CO. — S.I. REQ.? YES — FURN. YES — QUAN. REC'D 372

ROUTING II — SHIP. ORDER # A30878 — PACKING 15 CARTONS — COUNT HAND — BY H.H. — SHORT 0

METHOD & DEVIATIONS: VISUAL MOUNTING DIMENSIONS. ALL SAMPLES 2 1/8" BETWEEN MOUNTING HOLES. SHOULD BE 2 3/8".

METHOD 5% — SAMPLE 1. 18, 2. — — INSP. C.E. — DEF. 18 — ACCEPTED 372 — MISC. — — REJECT —

STOCK: DATE 6/23/53 — QUAN. 372 — COUNT HAND — BY R.L.

RETURN: S # — DATE — BY

MCD: DATE 6/24/53 — BY D.S.

DEVIATIONS: APPR. THIS LOT O.K. — APPR. ALL LOTS NOT APPROVED

REPAIR	SALVAGE	REJECT
QUAN. 372	QUAN. —	QUAN. —

DATE 6/22/53 — BY S.E.

DISPOSITION SENT TO STOCKROOM — BY M.R.

2

Begins on page 99

Only Five Key Forms Keep the Paper Work Simple

Main thing to remember is that forms should be the servants, not the masters, of a control plan. They should be set up in both number and detail to provide the information key people need to take proper action. You can't expect the forms to perform the control functions.

Here are the five key forms we use at Specialty:

1 STOCK RECORD CARD • Nothing new here; it's a well-known perpetual inventory record form. But it's essential. Specialty uses a 5x8-in. card, kept in Kardex files. The card originates upon receipt of a bill of materials from engineering for production jobs, or from purchase orders issued on spare parts jobs. And there's a card filed for each item in the stockroom.

2 RECEIVING AND INSPECTION REPORT • Receipt of material into the plant starts an RIR for *each item* received. A 5½x8½-in. size is convenient for pads. Specialty uses strip forms in register, which dictates size. Six copies go to accounting (2); incoming inspection; purchasing; stockroom, then to materials control; and receiving.

JOB NO. 280		DATE 7/8/53
TO: STOCK		FROM: G. A.
QUANTITY 6	ITEM NO. E-6	ITEM POWER TRANSFORMERS
CONDITION TERMINALS EMBEDDED TOO DEEPLY		
DISPOSITION RETURN TO VENDER		

3

INSTRUCTIONS

FOREMEN: Material for re-work or repair must be accompanied by **two** copies of this order. When finished, call for inspection, if required. Fill in time record below. If material is routed to Production, return **both** copies of this order to the Plant Manager. If routed to Incoming Inspection or Stock, send **both** copies with the material.

INSPECTION: Inspect where most convenient. Fill in section below and time record. If not accepted, ask the Plant Manager for instructions. See above for routing this order.

STOCK: Re-worked material must be accompanied by **two** copies of this order. After verifying count, sign both copies and forward them to the MCD.

MCD: After posting, sign **both** copies of this order and forward them to the Plant Manager.

RE-WORK ORDER NO. 462	CHARGE BACK: YES ✓ NO ___
DATE 6/24/53	VENDOR HARVEY, GOODSON
JOB AND ITEM NO. 280 E-6	ASSIGNED TO: MACH. SHOP
INSPECT: YES ___ NO ✓	ROUTE TO ST. RM. AUTH. BY: SE.

REQUIRED RE-WORK OR REPAIR 372 POWER TRANSFORMERS USE ROTARY FILE IN DRILL PRESS TO ELONGATE MOUNTING HOLES TO TAKE MOUNTING SCREWS SPACED AT 2⅜" BETWEEN CENTERS. NO OBJECTION TO OVER-SIZE HOLES. HAND FILE BURRS.

INSPECTION REPORT

INSPECTOR

NO. UNITS RE-WORKED 372	FOREMAN J.M.
CLASS MACH. HELPER HRS. 7	FOR STOCK R.L.
CLASS REPAIRMAN HRS. 3	FOR MCD S.W.

4

JOB NO. 280 ATTENUATOR SHIELD ASSEMBLY

ITEM #	DESCRIPTION	#/UNIT	TOTAL
M-6	Attenuator Shield	1	
H-28	Capacitor Clip NO TH-17	1	
H-4	Sems #4/40 x 7/16 Pin Head	1	
M-11	Shoulder washer, fiber	2	
H-20	4/40 Hex nut	1	
H12	Flatwasher #4	3	
E-71	Term Stud, insulated	3	
H-15	Lockwasher NO 4 Int. Tooth	3	
M-9	Trimmer Board	1	
H-3	Sems 4/40 x 3/8	2	
E-5	0.5 to 3 mmf Capacitor	1	
H-26	Speed Nut	1	
H-7	6/32 x 5/8 RH Screw NP	1	
E-7	.068 Capacitor	1	
E-39	2 meg. Resistor	1	
E-40	1 K Resistor	1	
E-41	10 K Resistor	1	
	TB101		
M-7	TB101	1	
E-9	39 mmf Condenser	1	
E-42	4500 ohm Resistor	1	
E-8	50 mmfd Capacitor	1	
E-43	540 ohm Resistor	1	
E-44	50 ohm Resistor	1	
E-3	1 mf Capacitor	1	
E-46	2.6 ohm Resistor	1	
H-27	Condenser clamp	1	
H-49	6/32 x 3/8 BHMS Sems	1	
H-21	Hex nut 6/32	1	
H-13	#6 Flatwasher	1	
	#20 Spaghetti	1	
	ATTENUATOR ROTARY SWITCH		
E-56	Rotary Switch	1	
E-36	2 meg Resistor	1	
E-38	51 ohm Resistor	1	
E-6	1600 pf Capacitor, fixed	1	
E-37	2 K Resistor	1	

FOR ___ UNITS

5

3 MOVE TICKET · Used only by foremen to return spoiled, unusable, or excess materials to the stockroom. It's 4x6 inches. Foreman sends two copies with the material. One stays in stockroom, other goes to materials control.

4 REWORK ORDER · Plant manager originates this order to repair material. After work is completed, the two copies are used by inspection, stockroom, and materials control before both return to the plant manager. Form is 8½x11 inches.

5 SUMMARY REQUISITION LIST · It lists all parts required to make a product, including number of each part per product unit. Requisition need note only quantity and identity of product.

IN ADDITION other forms normally used in any plant are utilized by materials control:

- **Purchase order,** for record of materials on order.
- **Bill of materials,** issued by engineering for each product, required to set up stock record cards.
- **Requisitions for materials,** used to post stock record cards.
- **Production schedules,** to review stock balances.
- **Work orders** (production authorizations) to review materials availability.

Materials control should also keep a log of confirmation of purchase orders and expediting efforts. Specialty uses standard 3x5-in. index cards, filed by purchase order number.

Salary increases at Bell & Howell are based solely on its outstanding ...

Merit Rating Plan for Executives

By WILLIAM HODGE
Director of Employee Relations
Bell & Howell Company, Chicago

WE'VE USED MERIT RATING at Bell & Howell for about ten years. At first it included only shop and office hourly employees. But three years ago we expanded it to include foremen and all executives — up to and including the company president.

Purpose? To measure, as objectively as possible, the caliber of our executive personnel.

Results? So good that a man's merit rating is today the only basis for advancement in pay. That doesn't include promotion to a higher-paying job, but naturally promotion possibilities hinge heavily on merit rating.

WHY RATE EXECUTIVES? The benefits of merit rating for hourly employees are well recognized. On a different level, they are much the same for a program of rating executives:

1. Merit rating identifies promotable men.
2. It is a formalized program of uncovering individual strong points and weaknesses, forms a basis for individual counseling and advice on the training a man might take to better himself.
3. It identifies men in the wrong job.
4. It checks the effectiveness of the company selection and advancement programs.
5. It focuses the attention of the executive's superior on the effectiveness of his organization, and provides a foundation for future development.

Rating Form

The form we use at Bell & Howell is shown in its entirety on the facing and next following pages.

At the left is a list of the 26 points on which all of our executives (foremen and up) are rated. (Production and office hourly people are rated on a much simpler form.) Under each item are listed five choices—ranging from *excellent* to *poor*. A brief explanatory sentence helps the rater select the proper rating.

For example, the choices under element 1 are: *exceptional mastery of all phases of his work* (which would be *excellent*, count 5 points); *thorough knowledge of practically all phases of his work* (4 points), *adequate knowledge of particular job* (3 points), *insufficient knowledge of some phases of his job* (2 points); *inadequate comprehension of requirements of job* (*poor*, scoring only 1 point).

There's an in-between rating, too. If a rater feels that the man being rated doesn't quite deserve an *excellent* but is better than *good*, he can check an in-between square, worth 4½ points.

Rating Procedure

Executives are rated once a year. At rating time, each executive receives two rating forms for each of the executives who report to him. One copy is for his rating of the executive, the other for the man's self-rating (more about this in a moment). The completed forms are normally returned to the industrial relations division within three weeks for scoring and recording. (The superior's rating is reviewed by an executive at the next higher level.)

A covering letter instructs the rater to (1) rate the man only on the position he now holds; (2) not allow personal feelings to govern the ratings; (3) avoid being influenced by recent unusual cases pertaining to any element to be rated; (4) rate only on performance since the last rating.

Two other points are particularly important:

1. Some of the elements clearly do not apply to all jobs. For example, some executives do not work under a specific budget. Rating them on element 19, which refers to budget accomplishment, would therefore be meaningless. So, in such cases, the rater simply skips this element.

2. The various elements all carry the same weight. This may not seen logical. Clearly some of the elements are more important in one executive position than in others. Shouldn't they be weighted? We think not. We've tried weighting in the past. But, to do a theoretically perfect job of weighting with such a large and diversified group, we found that each of the 26 elements would have to be weighted separately for each executive position. This would be extremely difficult, if not impossible. With several ratings under our belt, we feel confident that unweighted elements balance out and that the unweighted scoring is fair.

Text continues on page 105

Executive Personnel Rating

	EXCELLENT	GOOD	AVERAGE	FAIR	POOR
1. KNOWLEDGE OF JOB Familiarity with the various procedures of the work	Exceptional mastery of all phases of his work	Thorough knowledge of practically all phases of his work	Adequate knowledge of particular job	Insufficient knowledge of some phases of job	Inadequate comprehension of requirements of job
2. EXPERIENCE Skill and practical wisdom gained by personal knowledge	Broad background and training for particular job	A comprehensive background	An adequate background	Has some background but requires direction	Inexperienced or unsatisfactory progress
3. GENERAL COMPANY INFORMATION Knowledge of major and minor company policies	Thorough understanding and appreciation of all Company policies	Knowledge of practically all Company policies	Acceptable knowledge of Company policies	Limited knowledge of Company policies	Does not have enough information to be efficient
4. HEALTH Soundness of body and mind, and freedom from physical disease or disability	Robust, energetic	Sufficiently healthy and energetic to handle the job	Sufficiently healthy to handle job but not overly energetic	Frail, affected by pressure	Sickly. Affects his work
5. ENTHUSIASM A positive, ardent, and eager response	Believes wholeheartedly in the co. and expresses both orally and in his attitude that belief	Works enthusiastically, not too expressive	Matter-of-fact attitude	Definitely passive or indifferent	Negative in attitude
6. PERSONALITY The external mannerisms consciously or unconsciously adopted in meeting situations	Radiant, confident, poised, courteous	Pleasant, forceful	Likeable	Ill at ease, not too forceful	Negative colorless person
7. APPEARANCE Outward impressions made by a person	Superior style, grooming, taste and a sense of the fitness of things	Well dressed and neat	Neat, but not particularly striking	Intermittently careless	Slovenly and untidy
8. CHARACTER Integrity of an individual	Has the courage of his convictions and unquestioned habits	Morally sound. Tolerant	An average human being possessing average personal weaknesses	A person whose behavior harms no one but himself	A person who is a bad influence on the behavior of the group
9. MENTALITY Quality of mind, mental power, and creative intellectual ability of a person	Superior ability to think clearly and arrive at sound conclusions	Worthwhile ideas of his own, and ability to make useful decisions	Well informed on certain subjects useful in his daily work	Little ability to comprehend, interpret or grasp new ideas	Unable to reason logically
10. SOCIABILITY Sense of mutual relationship, companionship, and friendliness with others	A genuine interest in people and extremely well liked by others	A friendly, pleasant person, happy in a group	Willing to be a part of a group but makes little contribution	Poorly adjusted to the group	Unwilling to be a part of any group activities
11. ABILITY TO GET THINGS DONE Ability to perform, execute, and achieve an assigned task	Completes assignments in the shortest possible time	Completes assignments in unusually short time	Completes assignments in a reasonable time	Slow in completing assignments, or does not complete them	Takes a long time to accomplish little
12. COOPERATIVE An appreciation of collective action for mutual profit or common benefit	Greatest possible co-operativeness	Very co-operative	Co-operative	Difficult to handle	Obstructive
13. ACCEPTANCE OF RESPONSIBILITY Willingness to assume duties	Greatest possible sense of responsibility	Very willing	Accepts but does not seek responsibility	Does assigned tasks reluctantly	Irresponsible

Turn the page...

	EXCELLENT	GOOD	AVERAGE	FAIR	POOR
14. JUDGMENT Ability to grasp a situation and draw correct conclusions	Superior ability to think intelligently and use sound judgment	Excellent judgment	Good common sense	Poor judgment	Neglects and misinterprets the facts
15. INITIATIVE Desire and ability to introduce a new course of action	Seeks and sets for himself additional tasks, highly ingenious	Very resourceful	Progressive	Rarely suggests	Needs detailed instruction
16. EXPRESSION • Ability to articulate and orally express one's thoughts and feelings	Unusually articulate in expressing thoughts and feelings; master of good speech techniques	Speaks well	Nothing about his speech that is distinctive or distasteful	Careless speech habits and mild physical defects	Inarticulate and physical defects
17. RATE OF WORK The time taken to finish a specific assignment	Greatest possible rapidity	Very rapid	Good speed	Slow	Hopelessly slow
18. ACCURACY A high percentage of freedom from mistakes	Highest possible accuracy	Very careful	Careful, no more than reasonable time required for revision	Careless, time required for revision greatly excessive	Practically worthless work
19. BUDGET ACCOMPLISHMENT	Performs within budget even under severe circumstances	Performance almost within budget. Deviation	Performs within budget more than two-thirds of the time and seldom are deviations substantial	Misses budget frequently and deviations are substantial	Almost always misses budget and deviations are often substantial
20. CONDITION OF DEPARTMENT	Extremely orderly	Very orderly	No particular disorder	Disorderliness in department	Department very disorderly
21. HANDLING PEOPLE The ability to appreciate, understand, and direct individual differences	Extremely successful in helping and training his men to progress and attain their ambitions	Capable leader	Fails to develop and obtain maximum results from men	Fails to command confidence	Antagonizes his subordinates
22. DEVELOPING ASSISTANTS The ability to delegate responsibilities to the right individual	Superior ability in selecting suitable men and training them to assume specific responsibilities	Very capable in recognizing and training subordinates	Good in selection, but little attention is given to training	Allows subordinates to shift for themselves	Hinders the natural development of his men
23. DELEGATING WORK The assignment of specific responsibilities	Superior ability in recognizing individual's capacities, when he assigns tasks	Capable supervisor	Fails to recognize individual's capacities	Fails to see work to be done	Does all the work himself
24. PLANNING AND ORGANIZING Success in organizing, by delegating authority and planning	Highest possible effectiveness	Effective under difficult situations	Effective under normal circumstances	Lacks planning ability	Inefficient
25. VISION The power to see and imagine	Superior ability to think creatively, foresee and imagine	Very capable in anticipating the future	Ability to plan in advance	Overly realistic	Devoid of imagination
26. SELLING COMPANY POLICIES Company loyalty and an eagerness to tell others	An extremely loyal employee eager to express to outsiders his enthusiasm	A very loyal employee	Passive in his attitude toward Company policies	Critical of all Company policies	Disloyal and traitorous

Signature of Rater _____

Begins on page 102

Self-Rating

We understand self-rating is fairly unusual. At Bell & Howell it's optional, but almost all executives—over 95%—rate themselves.

In our experience there are two good reasons for the self-rating part of our plan:

1. Self-rating forces employees to make a careful self-appraisal of themselves and the kind of job they're doing. A realistic look at his performance by the man himself is perhaps the best stimulus for better performance—makes the man realize that only he can make himself a better executive.

2. Self-rating is a form of road map. It alerts the executive to the elements on which he is being rated, and prepares him mentally for his superior's rating. (Incidentally, B & H President "Chuck" Percy is rated by at least two of the executives reporting to him, and has his rating interviews with them.)

Scoring

Total possible points are calculated by multiplying the number of elements the man is rated on (remember he's not necessarily rated on all 26) by 5 (the maximum score for any element). Then the actual rating score is added up. "Actual" is divided by "total possible" to arrive at "percentage effectiveness."

For example, suppose a man is rated on every element (for a "total possible" of 26 times 5 or 130 points) and receives an "actual" from his supervisor of 100½. His "percentage effectiveness" is 100½ divided by 130 or 77%.

Finally, after scoring, the two forms are returned to the executive's superior, who then schedules an interview with the man being rated.

Follow-up Interview

The interview has the same purpose on an executive level as it has on any other employee level. Of particular importance on the executive level, though, is the fact that the interviews give an executive's immediate superior a chance to:

1. Make clear the standards of performance required, methods of operation desired, and his reasons for such expectations.

2. Discuss plans for improvement, plan projects and training that will make better use of the executive's abilities.

3. Talk frankly about the man's job, how it is being done, what improvement is possible, and how it can be obtained.

It gives the executive being rated an ideal chance to express his ideas, talk about his ambitions, even voice his complaints.

Both men have both rating forms in front of them. This gives them a chance to compare—and discuss the reasons for—any major differences of opinions. The man's superior is careful to discuss any differences, particularly if he has rated an element lower than the man rated it himself.

He can, if he's convinced he's made an error in his original rating, make a change in score.

Another thing. We've found that the better executives and foremen tend to under-rate themselves as compared with their superior's rating. This is good because it gives the man's superior a chance to encourage the man who should be encouraged.

Handling the man who over-rates himself is admittedly difficult. But careful discussion of the variances shows him where and why his superior feels he is weak, and seldom causes any friction.

Action Taken

The superior's rating form is made a part of the man's permanent work history. This rating is referred to: (1) whenever a salary increase for the man is requested by his superior; (2) at regular salary review time (yearly at a minimum); (3) when considering a man for promotion. The tie-in with salary works like this:

We have 20 executive "labor grades." Our job evaluation procedure establishes which grade any given job fits into. There is a salary range for each of the grades. For example, pay range 10 is for jobs paying between $96 and $147 weekly.

The next pay range is for jobs paying between $103 and $158. (Note that the ranges overlap.)

A man who receives a merit rating "percentage effectiveness" of 94% to 100% is eligible to receive the top salary in the range. Men with lower "percentage effectiveness" ratings receive proportionately less, down to a man with a rating of 72% or less, who receives minimum pay in this range.

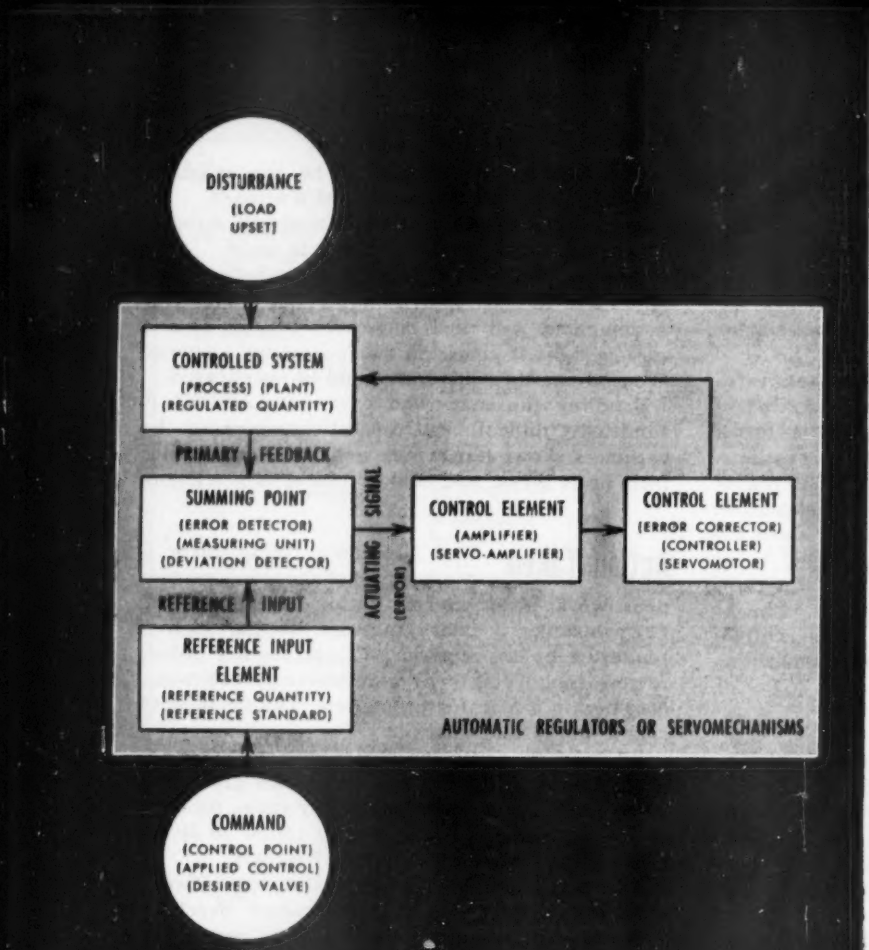
It is a policy at Bell & Howell that no man can get a pay increase beyond one merit rating step above his actual merit rating (that is, a man in pay range 10 whose actual rating is 75% effectiveness can receive no more than $121.50 a week), except in exceptional cases such as recent job transfer, outstanding improvement since last rating, or the first rating of a new man.

If a man's rating drops below a previously established level, he is carefully watched in case slipping is continuous. But this rarely happens.

Oftentimes it's necessary to rate a man just after he has taken a new job. In such case, his superior's rating would not be too meaningful. So either of two steps is taken: (1) The rating can be withheld until a later date; or (2) the new superior can ask the executive's former superior to make the rating. Then all three men sit in on the interview.

* * *

TO SUM UP · Our executive merit rating system is well worth the time and effort its administration requires. We think it's the best and fairest method to measure executive caliber. And we use that measure constantly to develop the best possible management organization.



ELEMENTS OF A FEEDBACK CONTROL SYSTEM . . .

The "closed-loop" arrangement of the summing point, control elements, and controlled system distinguishes feedback. There's no universal terminology, so several popular alternates are noted for each of the AIEE-recommended names.

. . . AND HOW A GROUP

Information from an analysis of an end-product can be fed to a computer which will determine the changes to be made

"Feedback"—Heart of Automatic

Western Electric's plant management group kept hearing that "feedback control" was at the heart of truly automatic operation. They wanted to understand it—but didn't want to tackle a super-scientific explanation.

So they assigned the explaining job to the head of plant engineering. This article is based on what he produced.

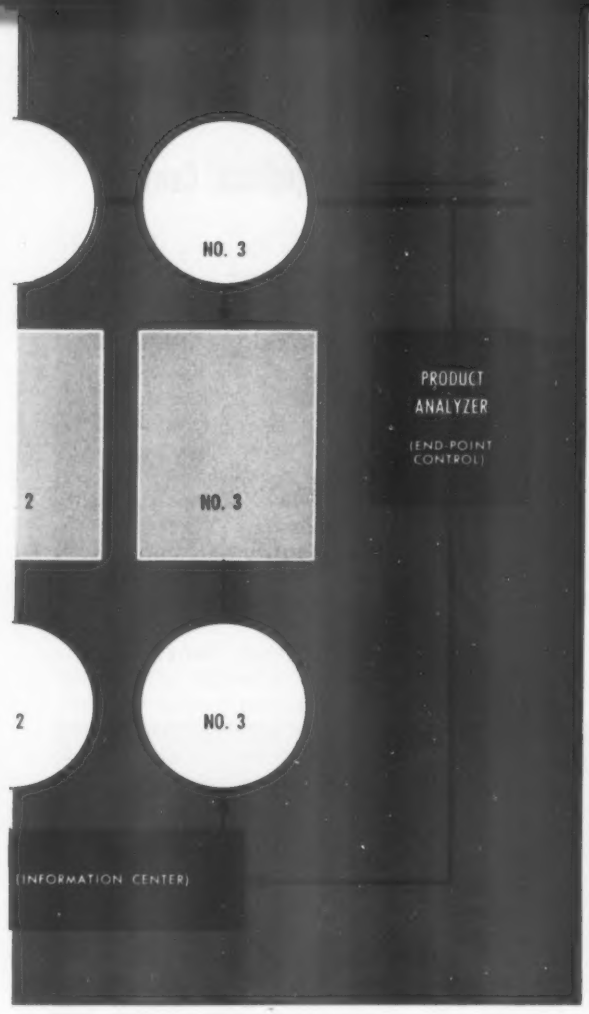
By PAUL LINDHOLM • Department Chief,
Plant Engineering, Western Electric Company, Inc.,
Kearny, N. J.

WHEN A PRODUCTION MAN speaks about an "automatic machine" or "automatic process," or just plain "automaticity," he may be talking about:

1. **Automatic sequence control,** or
2. **Automatic process control.**

To get clear on the distinction, let's look briefly at your house-heating system. To save yourself the trouble of everlastingly turning the furnace on and off, you might attach it to a time clock. Set it so it's on for 20 minutes, off 40.

That's automatic sequence control. After a lot



OF LOOPS MAY BE INTEGRATED

in a whole interconnected series of processes to maintain desired quality or quantity of output. Computer will also insure continued balanced operations during the changes.

Process Control

of trial-and-error, you'll find an on-off cycle that will keep the house comfortable—until the weather changes. This is an "external variable" that causes trouble.

FIRST STEP TOWARD AUTOMATIC PROCESS CONTROL

So your next experiment might be with a thermostat on the outside of the house. Start and stop the furnace on the basis of the weather. Now you'll find you have to calibrate for rate of room heat loss due to such varying factors as wind velocity, direction, frequency of doors opening, etc. It can be done, but it's not easy.

This is open-loop or open-ended process control. Trouble with this open-loop system is that there is no reflection of the room temperature on the outside thermostat; there is no interrelation.

FOR TRUE AUTOMATIC PROCESS CONTROL—THE FEEDBACK

So now you move the thermostat inside the room. The thermostat senses the temperature of the room—or "measures the process"—in terms of exactly the variable you want to control.

This is true automatic process control—the closed-loop or feedback system—in its simplest form. Here you have a system of automatic self-regulation, because information regarding the measured process variable (temperature of the room) is fed back into a stage of the input (furnace starter) in order to regulate the process.

The significant point in feedback control is that there must be an error or deviation from the desired value of the process variable in order to effect a correction. Of course, the size of the error needed to bring about a correction must be kept to a practical minimum. If you're willing to spend enough money on the design of the feedback control system, this error can be kept within very narrow limits indeed.

This continuous error-correcting action of the feedback system results in what is known as hunting, or a tendency to self-oscillation.

Again, the simple room thermostat can be used to illustrate the point. If you set it for 70 degrees, it will turn the furnace on at, say, 69 and off at 71. When the furnace goes off, there is still steam in the radiators, so the room continues to get warmer for a few minutes. Then it begins to cool. At 69 the furnace comes on, but it takes some time to get the steam up and reverse the downward movement of the temperature.

Obviously, the feedback control systems used by industry are far more sensitive and precise than home thermostats (most of them cost a good deal more, too). But the same hunting takes place.

THE INFORMATION CENTER INTEGRATES A NUMBER OF FEEDBACK SYSTEMS

If a process requires the integration of many feedback systems, they have to be connected to an information center. This, in turn, adjusts the individual feedback systems in accordance with the product output analysis. An example would be a continuous process line in an automatic factory.

At the heart of these control centers are the information machines better known as computers. The popular use of computers in the past has been that of computation. Hence their name. However, they are capable of much broader application. It is possible to design computer devices to furnish results in suitable form to make any number of closed loops or mechanized controls function in ac-

cordance with a predetermined program. For instance, computers to link measurement of product quality with process control.

As completely automatic factories and processes are developed in the future, computers will be the devices that will extend the realm of automatic control. They will make possible the almost entire elimination of the human element. They will perform fantastic feats almost beyond belief in terms of speed, and deliver quality heretofore unknown. The block diagram on pages 106-107 illustrates, in an elementary manner, how a group of loops may be integrated through the use of a computer and end-point control or continuous analysis of the product output.

After the process is in dynamic equilibrium (the condition of over-all balance required for trouble-free operation of a continuous process), it is possible to keep it so by end-point analysis of quality and quantity. The computer can determine by how much and at which in-process point an adjustment is needed. Then it will automatically transmit to the command of the corresponding servomechanism or automatic regulator the information needed to restore the end-point analysis to its predetermined condition.

CAN THE HUMAN ELEMENT ALWAYS BE ELIMINATED?

There will be a definite trend toward further use of automatic process control in industry, especially in the continuous process. In the discontinuous or step-by-step processes, the effort will be to adapt such controls to individual operations, where production requirements warrant and the added cost of the investment can be written off on mass production. However, this does not imply that the human element will be entirely eliminated. There will be many cases where automatic control will not be complete because:

1. The size of the investment may be prohibitive.
2. Human beings will be necessary to handle unforeseen conditions that the automatic control system has not been set up to cope with.
3. Human beings will be needed to maintain not only the increasingly complex process equipment, but the automatic controls as well.

ROLE OF MAINTENANCE IN AUTOMATIC OPERATION

The best-laid plans will fail if these high-investment, automatic-process systems are out of production even for a short time.

So, as part of any program of automatic control application, you should include training of selected men to maintain the controls and equipment. That looks like just about the only way you can hope to get the maximum continuity and output of quality and quantity needed to justify the added investment involved in creating an automatic factory.

Six Elements of Feedback Control

Now let's take a look at the elements that make up the closed loop of any feedback control system. What you call them is still something of a problem; they have many different names. However, the American Institute of Electrical Engineers has issued a "proposed standard" for the nomenclature. The block diagram (previous pages) give the AIEE-recommended terms in CAPITAL LETTERS, with the more common alternate terms in parentheses.

Two of the six are actually external influences:

- **The command** is the physical determination of the desired value of the measured process variable. It involves setting a pointer, turning a knob, etc., to a value that corresponds to the condition you want to maintain. Command can be manual or automatic (as part of *another* control system).
- **Disturbance** is the physical change of some factor in the process (or external to it) that causes a change in the measured process variable. On a controlled motor, for example, disturbance may range from an increased load or drop in line voltage to a change in ambient temperature.

The four "elements" that comprise the "closed loop" of the feedback control system are:

- **The reference input element.** This is a physical device that "receives" the command and translates it into a signal or position that can be measured or detected by . . .
- **The summing point.** This serves two functions: It compares the measured or detected information from the reference input element with measured or detected information from the controlled system (see p. 109). It generates an actuating signal, based on the difference of the two compared measurements, and transmits it to . . .
- **The control element.** The two functions of the control element are first to amplify the actuating signal, and then to use that amplified signal to change some factor affecting . . .
- **The controlled system.** This is the process or operation of which some measurable variable is to be regulated. The control loop is "closed" by a primary feedback signal (another "translation" of measurement) from the controlled process back into the summing point.

The control element changes the controlled system until it matches the reference input element. Any variable may be regulated—such as speed, frequency, temperature, position, torque, direction, and voltage. Similarly, any unit of measurement may be used as a reference standard.

The reference input measurement unit need not be the same as the controlled system measurement unit, so long as they are made compatible. That is, if speed and temperature are being matched, the two units can be converted to a voltage base through suitable transducers. For example, a thermocouple converts temperature to voltage, a tach-generator converts speed.

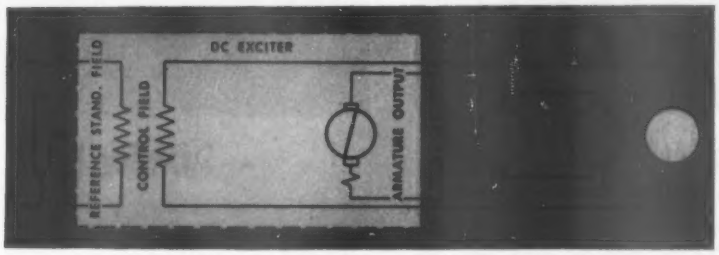
Automatic Speed Control: a typical job for a feedback system

To see how a complete feedback control system operates, let's look at the practical problem of automatic speed control. Typical plant applications would be reeling drives for paper machines, the rolling mills of steel plants, and all types of textile machinery.

START WITH AN OPEN-LOOP ARRANGEMENT...

The basic system used to control output speed in all the following stages of development will be the adjustable voltage (Ward-Leonard) arrangement shown here. This consists of the familiar MG set and a motor with a constant excited field. The potentiometer in the generator field controls the armature voltage.

Since this is an open-loop control, the output speed will not necessarily follow the potentiometer control setting, due to inherent characteristics, heating, load, and other effects. The speed regulation will depend entirely upon the inherent characteristics of the generator and motor.

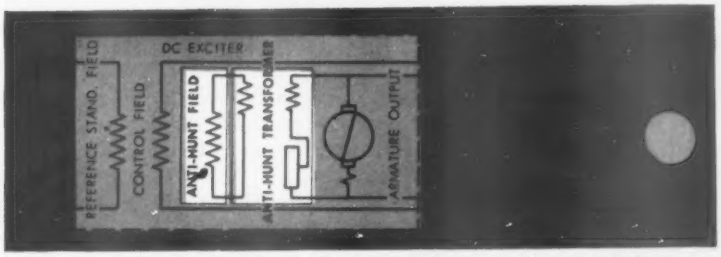


...CLOSE THE LOOP BY ADDING A ROTARY EXCITER...

To change from an open-loop to a closed-loop system, you simply add a tach-generator and a special d-c exciter, which is in effect a rotary amplifier. This gives you an automatic speed regulator or feedback control system for maintaining a constant motor speed, and is shown above.

The output speed of the motor is controlled by the applied voltage to its armature through the generator. But the generator field is now excited by the rotary amplifier. This device uses a reference standard field, the reference being a constant voltage source, and a control field excited by the tach-generator. (For simplicity, the reference standard field and the control field are shown as separate fields. It is possible to combine the function of these two fields into one by other circuit arrangements.)

The control field and the reference field are balanced when the motor speed is at the desired value. Any deviation from the desired speed causes a corresponding change of the tach-generator voltage. This changes the field of the rotary amplifier in such a direction that the proper correction voltage is applied to the generator field, thereby changing the motor speed.



...THEN STABILIZE IT BY ADDING TWO TRANSFORMERS

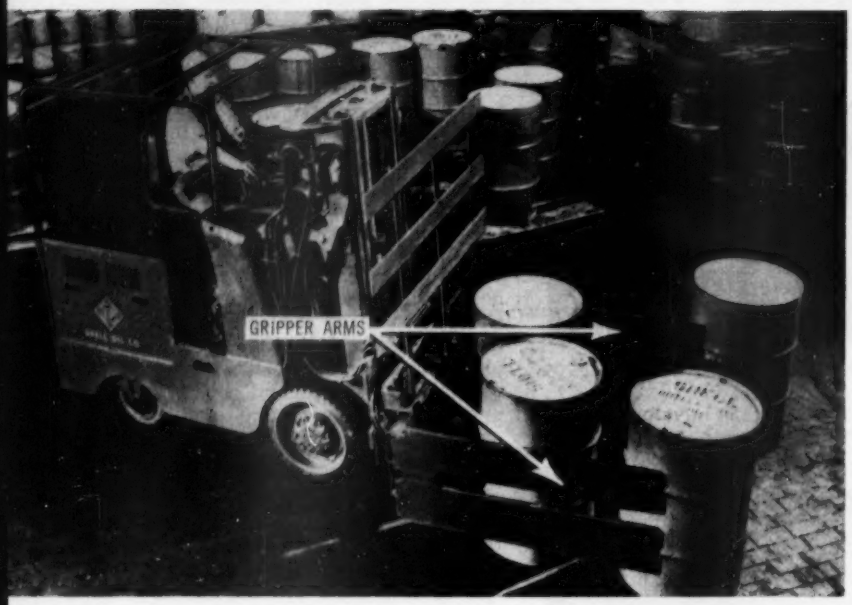
We noted previously that feedback control systems have a tendency to hunt or become self-oscillating. The diagram above shows one method (there are several) of introducing a damping or anti-hunt feature into the automatic control system diagram.

This is done by introducing another field excited through the secondary of a transformer whose primary is connected across the armature circuit output voltage.

In anti-hunt circuits the feedback is negative and proportional to the *rate of change* rather than to change alone. Constant output voltage induces no voltage in the secondary winding.

Under this condition, no current flows through the anti-hunt field. However, if the output voltage changes, a voltage is induced in the secondary winding of the transformer, which is proportional to the rate of change of the output voltage.

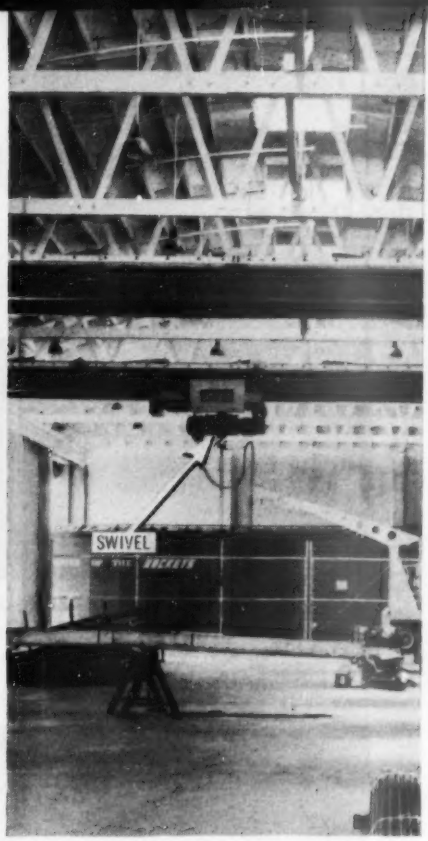
Now a current will flow through the anti-hunt field, and will be proportional to the rate of change of the output voltage. Polarity, negative to the control field, opposes too rapid changes in the output voltage.



New Gripper Arms for Fork Trucks

Shell Oil Company developed this lift-truck attachment to eliminate pallets, thus lop up to $750,000 a year off its distribution costs.

The same gripper arms handle different types of loads—drums and packages, for instance. Their thinness permits close stacking to save space. Friction provides the main lifting force. The friction factor is raised by special shaping of the arms plus corrugated facings where they contact a load. The largest attachment handles almost two tons.



Swiveling Hoists

Box cars have been loaded and unloaded faster at the new Perry Kilsby, Inc., warehouse, Los Angeles, since hoists with swivel bases were installed on two overhead cranes (The Crane-Veyor Corporation).

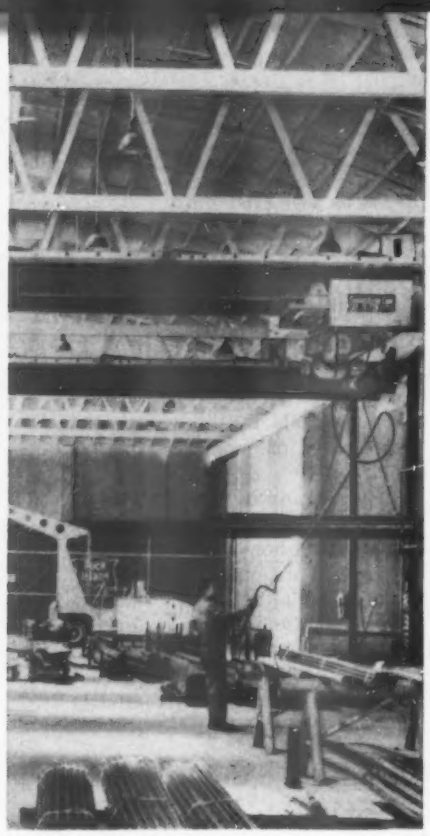
The 3-ton capacity cranes have

Twin Units Guard Electrical Tests

Two-stage smoke detectors (Cardox Corporation) safeguard units for testing electronic equipment at Boeing Airplane Company's Wichita Division.

First-stage panel (right) signals unit malfunctions, caused by such things as burned-out tubes, power failure, or tampering. Second-stage panel (left) announces electrical overloads, revealed by small amounts of smoke from burning insulation in overheated circuits.

Panels get signals from 22 ceiling-mounted detectors in Electronics Building.



Speed Handling

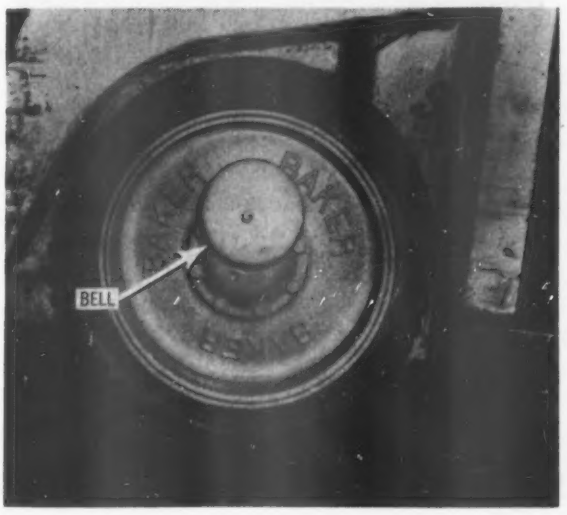
47-ft. spans. The hoists swivel in any direction on a 280-deg. radius. Thus operations are more flexible, and loads can always be pulled with the hoist drum grooving. A locking mechanism secures the hoist in different positions for various lifting jobs.

3-D Templates Do 3-Fold Job

Three-dimensional templates are aids to (1) designers in analyzing parts design, (2) machine operators in interpreting blueprints, and (3) inspectors in visualizing finished parts at Norton Company, Worcester.

The templates are used in connection with drilling operations. Transparent plastic blocks, they are ground to size, polished, and machined to the same specifications as metal parts.

Here an inspector checks a hydraulic manifold.



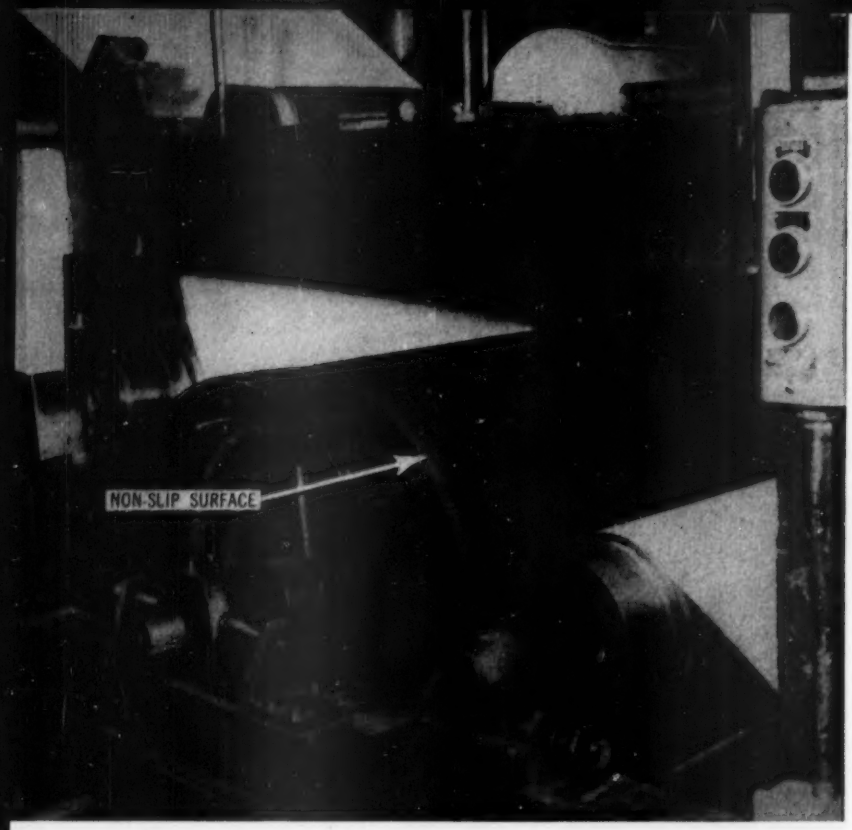
Safety Tune: Bells on Their Wheels

Bells on wheels of electric fork trucks clang a warning to workers when the trucks are moving at Emerson Electric Manufacturing Company, St. Louis.

Battery-powered trucks run almost noiselessly. So the bells are a foolproof "gangway" signal when drivers forget to sound their horns.

Developed by an Emerson safety engineer, the bells are bolted to the trucks' wheel lugs (see photo). A small steel ball, left free to rotate in the bell housing when a truck moves, does the ringing.

Turn the page



OPERATING SHORTS

Begins on page 110

Non-Conveying Use for Conveyor Belt

How do you assure proper tension between rolls in the continuous processing of coated abrasive stock?

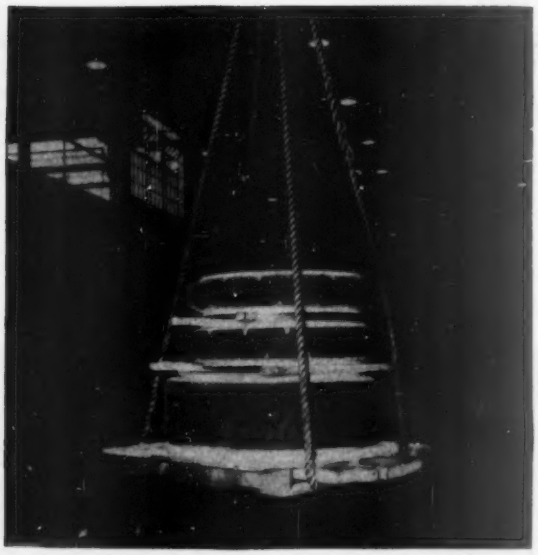
Behr - Manning Corporation, Troy, N. Y., does it by covering rolls with a non-slip rubber conveyor belt called Ruff-Top.

This special material (made by Thermoid Company) is usually used to convey packages up an incline. Molded into its surface are thousands of irregularly shaped gripper points to prevent slippage.

"Lazy Susan" Simplifies Sorting

Selecting lumber for box lengths is a simple matter at General Box Company's Louisville plant—thanks to this revolving woodpile.

Boards are sawed to different lengths, then moved by conveyor belt to the turntable. Inspectors, stationed on the wheel's perimeter, select the lengths they want as the wheel turns.



Simple Way to Crane-Lift Pallet...

... and it costs almost nothing. Pick a pair of 2x8's, each about a foot longer than the pallet's width. Slide them through the pallet. Loop crane slings under the ends of the boards. And hoist away.

This stunt is used often at Nordberg Manufacturing Company, Milwaukee—particularly when unloading palletized items from trucks that can't be entered by fork truck.

For better answers

to your tougher problems...

...Operations Research

By MORLEY G. MELDEN • Assistant Editor, FACTORY

You'll be hearing plenty more about it. Not just ivory tower stuff, either. It's already working for some plants. Could be doing more . . . if industry understood what it's really all about.

Here's what operations research is, what kinds of problems it can help you solve, what tools it offers for your use . . . and examples of how it's being used today.

What is operations research?

When you come right down to it, operations research is nothing but an extension of the best industrial engineering practice to include more advanced mathematical techniques.

Big problem is, most operations researchers don't know much about what industry has done already. And they speak a different language—one that is difficult for people other than mathematicians and scientists to understand. As a result, they have done little work up to now in the field of plant operation.

But more and more industrial engineers are entering this field. They're learning some of the higher mathematics. *You can expect better solutions to your problems as operations researchers acquire more industry experience and industrial engineers learn more about operations research.*

Operations research is really a name to describe the work of people using these scientific methods and tools for solving management problems. It won't replace the executive or relieve him of decision-making. It merely gives him better information on which to base his decisions.

How does it differ from industrial engineering?

Difficulty has been in getting industry to understand the difference between operations research and industrial or management engineering. Operations research often uses advanced mathematical tools unfamiliar to engineers to supplement their usual methods of solving problems. It harnesses additional brainpower that industrial executives haven't been able to make use of before. It takes an outside objective viewpoint with the unfaltering desire to seek out the underlying causes of problems.

Operations research attempts to study the effects of more and more variables. It helps in putting numbers on factors that you wouldn't be able to put numbers on ordinarily. Operations research studies the objectives as well as the problems. It uses *company goals* as the only valid objectives.

OK, so you still don't think it's very different. You've been solving problems for a long time. Operations researchers admit that a lot of the industrial engineering and management problems studied in the past could properly be called operations research.

Gilbreth's analysis of motions in bricklaying and Camp's economic-lot-size equation could well be classed as operations research. Statistical quality control is as much operations research as any of the developments now being talked about.

In fact, these now-familiar techniques remind us that, as the newer techniques of operations research become more generally understood, they too will become standard tools of management.

Why it's important

For years you've had many of the problems that operations research is able to tackle. And you've been solving these problems, too. But your solutions have not always been as good as you would like them to be.

Today, competition and high labor and material costs are forcing you to get better answers in order to stay in business. Operations research tries to find better ways of getting maximum returns from the dollars you spend. It's another kit of tools you'll want to use in the never-ending struggle for more efficient operations.

To learn where operations research can be used most effectively, turn the page

Begins on page 113

Operations Research Can Help You Tackle Problems Like These

In general, you should reserve the tougher problems for operations research. And you will want to make sure that possible savings will justify the effort expended to solve them. Here are some examples. Although simplified here, they're the kinds of problems operations researchers can go to work on.

SCHEDULES · Complex scheduling problems with many variables have always been difficult to handle. You can invariably come up with a schedule that works, but usually it is not the best you could have produced. Reason: You can't compare all the possible programs in your mind to see which one has fewest hours, lowest cost, or minimum set-up times. Progress is now being made toward licking these problems by operations research techniques.

Take the problem of scheduling assembly production. Your assembly department may have to build ten different kinds of products in varying quantities next month. How many of each should you schedule? Is it better to build larger quantities of a few products, building different ones in different months? Or is it better to always have a few of every type on hand? What happens if parts aren't available for some products?

Scheduling problems really go haywire in a large job shop where quantities are small and variety is large. How do you consider engineering changes, last-minute orders, variable sales—when setting up a schedule? Which parts do you subcontract? How do you keep most of your machinery and people busy all the time—and still make parts as efficiently as possible?

Other kinds of scheduling problems are:

- Scheduling material flow for minimum handling or shortest total distance traveled.
- Ordering parts for lowest safe inventory to satisfy production requirements.
- Scheduling direct labor to assure lowest production costs.

DECISIONS · All of your problems require decisions. But some are clearly selections between two or more alternative decisions. For example, should you produce a special bolt on a turret lathe, engine lathe, or automatic? Usually the decision depends on the quantity—but how do you know where the quantity breaks should be? You may want to take into consideration such things as probable future demand, what the equipment could be working on otherwise, or how fast you need the bolts.

Other questions involving choice of alternatives: Should you subcontract or work overtime? Purchase parts or manufacture at home? Promote from within or hire an expert? Buy two specialized machines or one general-purpose machine?

You may already be answering questions like these satisfactorily. In some cases, though, you often lack sufficient information to make a decision you have confidence in—sometimes because the information may be hidden or hard to put your finger on. By increasing your knowledge of the factors affecting a decision, and by increasing your quantitative data, operations research may give you information that will lead to better decisions.

Certain problems require decisions other than choices. How do you lay out a new plant or department most efficiently? What should quality standards be—in order to balance inspection costs with customer demands? What kinds of processes do you handle in your factory and what do you have done by outside concerns?

PREDICTIONS · There are many problems in which you can predict over-all group characteristics from a study of sample values. For example:

- Safe inventory policy from a sampling of inventory history.
- Production requirements from a sampling of sales orders.
- Allowances for process scrap from a sampling of scrap history.
- Demand for medical attention from sampling of people waiting in the dispensary.

Many factors have to be evaluated and considered for their effects on probable results. This requires more than mere statistics of past performance. It includes projecting into future possibilities and answering questions like:

- What are the effects of obsolescence?
- What happens if production must be doubled?
- What are the effects of changing interest rates on new capital?
- How will changes in wages affect the results?

BOTTLENECKS · Many of your problems concern bottlenecks of one form or another. Some are like waiting lines—people or parts waiting for service. For example:

- People waiting for cafeteria service, or at the plant dispensary, stockroom, or tool crib.
- Parts waiting between machining or assembly operations.
- Demand for special tools and equipment—what happens if you have three lift trucks and six departments need truck service at once.

All these problems require balancing certain service or facilities against the ill effects of not enough service. Question is, how do you know when you have an economic answer?

COMMUNICATIONS · Controlling the amount of paperwork is becoming more of a problem every day. So much so that companies are analyzing the whole question of what forms to use, kinds of information, and how to reduce and combine paperwork. So far operations research has been able only to clarify objectives—but a lot of the electronic equipment the operations researchers are playing around with may some day simplify complex record-keeping tasks.

"HOW MUCH" · The big question of "how much" enters into many of your problems:

- How much do you spend for maintenance?
- How much do you spend for employee benefits?
- How large an incentive bonus do you provide for workers?
- How much on-the-job training do you provide?

These are questions that have been solved by judgment, often with very little quantitative knowledge of how far you should go to get the greatest pay-off. Let's take one situation:

One company's machine tools were getting old. Repairs were mounting, but new machines didn't offer any advantage of increased productivity. Question was—how much should they spend to maintain old equipment before it became economic to replace? Studies led to increasing preventive maintenance effort on old machines 75%, according to a specified schedule, where previously some people had wanted to scrap them and buy new ones.

Other "how much" problems:

- How much expansion of plant facilities?
- How much to spend on a cost-reduction program?
- How large should lot sizes be when you have to consider limited storage space, obsolescence due to engineering changes, and amount of money tied up in inventories?

"HOW TO" · There are a lot of things you want to know how to do better: How to select foremen, how to select quality standards, how to assign work to an overloaded staff.

In some cases this involves learning a lot about a particular subject. In other cases mathematical correlations would help considerably.

For example, in selecting foremen there are a lot of factors that affect success as a foreman—experience in company, personality, ability to make quick decisions, loyalty to both company and workers. Wouldn't you like to know how candidates stacked up on the basis of the qualities most important? You'd probably have to know the importance of each of these qualities, too. If you had a realistic formula for relating the desired qualities to the characteristics of foremen candidates, you might make a better choice.

"WHEN TO" · Problems of timing are becoming especially important as industry increases production speeds with mechanization and automation. When to lubricate and service equipment so it won't break down—but without servicing it more frequently than is necessary? When to order parts and materials so that you maintain continuity of production?

Solving these problems most effectively takes skill in determining the economic effects of bad timing. Judgment has produced a lot of favorable results in the past, but mathematical correlation and balancing of alternative costs (or losses) may produce better results in the future. Other when-to problems:

- When to replace equipment.
- When to work overtime.
- When to increase production facilities.

Typical Problems Solved by Operations Research

Locating production to minimize shipping costs

Freight costs are a large portion of the cost of materials for one manufacturer. The company had three plants in widespread locations and wanted to know which products to make at each plant in order to minimize material freight costs.

Solution: Linear programing (see page 117) was used to develop a schedule of which products to produce at each of the three plants in order to reduce freight costs to a practical minimum.

Predicting production time standards

A company producing complex industrial equipment had difficulty setting reasonable time standards in advance of production. Product variations and style changes were many and frequent. Quantities of any given model were small. It became impractical to timestudy each product or assembly.

Solution: Mathematical equations were used to relate the physical characteristics of the products to the time required to produce a given amount of work. These equations were used with a limited amount of time study data to set up production time standards. Resulting standards were based on product characteristics, equipment used, and worker efficiency.

Basis for an equitable bonus system

An electrical manufacturer has several operators, each tending a group of complex semi-automatic

machines. The existing bonus plan resulted in dissatisfaction. Reputable consultants and well-established bonus plans were tried. No one was able to locate and eliminate the causes of employee dissatisfaction.

Solution: Operations research used "waiting line" theories (see page 119) to develop a mathematical formulation or description of the operation. It showed how product characteristics, labor efficiency, and machine characteristics affected production. It also showed how the operator could influence results, depending upon the incentive plan in force. Operations research did not produce a new incentive plan, but it did give the company a basis for constructing a more suitable plan.

Planning optimum inventories

A company producing valves, bearings, and other similar components needed a sounder inventory policy. It wanted to know what to produce, the size and type of inventories to maintain, and how to adjust production for changes in demand.

Solution: An operations research team applied principles of electronic feedback control (see page 120) to develop a better inventory control and re-ordering procedure. Now changes in customer demand or in other business conditions are reflected back into inventory policy decisions.

Estimating amount of clerical work

A company wanted to know how it could determine the size of basic clerical tasks to be performed in various departments. It required a quick but accurate method that did not involve a detailed study of internal clerical operations.

Solution: Operations research developed a simple method for estimating the size of basic clerical tasks by measuring the over-all input and output of information. The system was based on principles used in communication—to determine how much information can be sent over transmission lines.

Planning parts runs for customers

Inspection rejects made it difficult for one subcontractor to figure the right number of pieces to produce for each order. Customers would pay for a slight over-run, but further excess parts had to be scrapped. But, when too many imperfect parts resulted in an incomplete order, an expensive new set-up had to be made to produce more parts.

Solution: A statistical analysis was made of orders and rejects. Equations were developed to balance possible profit losses due to over-runs against possible profit losses due to extra set-ups that might be required if they ran short of good parts. Finally charts were prepared to enable the company to read directly the number of parts that would maximize probable profits. The quantities were determined according to original size of order, unit production cost, and set-up cost.

The Tools Used by Operations Research

Four features of the operations research approach to problem-solving are:

1. A firm conviction that intangible factors can be related. No variables are really intangible. It's just that you've had to call them intangible because their effects were not obvious or could not be easily evaluated.

2. A team combining your experience with theirs. Operations researchers ask you to add your industrial experience to their skill in science and mathematics.

3. A scientific procedure for problem-solving:
   - Orientation—defining the problem.
   - Gathering data on factors affecting results.
   - Analysis of data—using mathematical tools.
   - Development of a formula or plan.
   - Testing the plan on a sample problem.
   - Developing working tools that your people can use in handling similar problems. Final methods must be simple procedures that workers can use. These may not resemble the fancy formulas—but should give similar results.

4. A great many tools to work with. You already know some of them. Others still haven't been developed to the point where they have practical value in the plant. So let's take them in order, beginning with the ones you're already familiar with:

SIMPLE ARITHMETIC

Operations research gets you to think more clearly and weigh alternatives—by putting values on important factors. Sometimes you don't even have to be a mathematician to apply its principles. You can use simple arithmetic.

Here's a homey example: Suppose your wife announces that she needs the car tomorrow (to go shopping for a new dress). Being an obliging soul you say O.K.—leaving you with either a train or bus ride to work. Train fare totals $1.25 round trip. Takes a half-hour each way. Round-trip bus fare is 50¢. Takes a full hour each way. You decide to take the bus and use the 75¢ saved for lunch money.

Now suppose you wanted to analyze this choice. First you have to include a few other significant factors—extra time the bus takes, inconvenience because you'll have to stand on the ride home, extra sleep you'll lose in the morning by taking the bus.

To consider these factors properly you have to put values on them. So you notice it takes an extra

hour altogether by bus. Your spare time is certainly worth a cent a minute. That's 60¢. After a hard day's work, a seat on the bus ride home might be worth an extra 20¢ to you. And that extra half-hour's sleep in the morning might be worth at least 15¢. Let's see what you have now:

REAL AND INHERENT COSTS

	TRAIN	BUS
Basic round-trip fare	$1.25	$ .50
Extra hour used on bus trip		.60
For a seat on the bus		.20
Loss of extra half-hour's sleep		.15
Total real plus inherent fare	$1.25	$1.45

At this point you might figure you'd be better off to take the train.

(On the other hand, maybe you can convince your wife that if you took the car, she'd save $30 by not buying that new dress. If so, you're a real expert in operations research.)

STATISTICAL METHODS

Industry is already familiar with the use of statistical methods. Operations research tries to extend their use to develop more meaningful statistics than you have had before.

Work sampling, ratio delay, and statistical quality control are all terms relating to laws of probability. Vast amounts of data can be correlated so that tendencies and rules for predicting future behavior can be devised. Also large amounts of information can be obtained from relatively small samples. This can save considerable time and expense in gathering data. (This important aspect of operations research was discussed in FACTORY in an article on "Work Sampling"—July, 1952.)

The comparatively new science called "Econometrics" is developing many new statistical tools along with other types of mathematics. Econometricians set up mathematical models of economic situations so they can see what effect changing some factors will have on the result. Probability theories play an important part in most of this work and form the basis of many of the other theories mentioned here.

STANDARD INDUSTRIAL ENGINEERING METHODS

All of the devices helpful to industrial engineering and management are used when practical by operations researchers. Charts, graphs, and nomograms are helpful for summarizing results and as daily working tools for those of us who aren't mathematicians but would like to use the results of operations research. Tried and proved industrial engineering tools like time-and-motion study, work simplification, and methods analysis also make good members of the operations research team.

MONTE CARLO METHOD

This technique is sometimes used to solve problems that require a numerical answer but are too difficult to solve by rigorous mathematical procedures. It usually requires taking random samplings many times or performing simple calculations over and over again in a random way. Electronic computing machines are sometimes used because they can perform these calculations at very high speeds, therefore getting closer and closer to the right answer in a relatively short time.

Suppose you were making high-precision ball bearings and wanted to know to what tolerances the balls and races should be held. The balls will all vary in a random way, and when 20 balls are assembled around the inside of the race they must fit perfectly. If the combination is too loose or too tight, the bearing will have to be reassembled with new components until a better "fit" is obtained.

Let's assume that it would be impractical to gage the parts in assembly and you aren't tooled up to produce parts yet. Problem would be to find a compromise between the cost of extra precision and the cost of trial-and-error assembly—so you can decide on the optimum tolerance.

Starting with an assumed set of tolerances, it is possible to determine the distribution of the various sizes of balls and races. In other words, how many vary how much from the theoretically ideal dimension. By random sampling of this distribution and comparing the total dimensions from each set of 20 balls and a race, you could determine the probability of a perfect fit.

By using random sampling of dimensions many times, you would come close to the actual answer without measuring the parts. You could then use this information to justify more or less tolerance—and all before production began.

LINEAR PROGRAMING

Here is one new method that has already been applied to industrial situations. It can be used to solve problems where many variables have to be related—production scheduling, for example.

Linear programing is a tool for securing optimum results in a specific situation. Once the problem can be defined with satisfactory restrictions, all the possible solutions can be compared simultaneously to maximize or minimize results. In scheduling problems the result could be minimum cost, minimum hours, or smallest labor force.

There is considerable difference of opinion as to the merits of linear programing. Some think its widespread application would be desirable—others think it is limited and cumbersome. Actually, it

won't take all factors into consideration—you have to put limits on the problem. And while some of the mathematical methods are cumbersome (sometimes requiring the help of electronic computing equipment), simplified forms of linear programing are already being used in some plants.

Here's a simplified example of one kind of problem that can be handled by linear programing. You want to divide orders for six different parts among three different machines in such a way that total machining time will be minimized. The first table shows the quantity of each part to be made in a given period and the number of hours available on each machine for doing this work.

PROBLEM

TABLE 1

	UNITS						AVAILABLE MACHINE HOURS
	PT 1	PT 2	PT 3	PT 4	PT 5	PT 6	
MACH 1							80
MACH 2							30
MACH 3							160
PARTS REQ	10	40	60	20	20	30	270

TABLE 2

	HOURS PER UNIT					
	PT 1	PT 2	PT 3	PT 4	PT 5	PT 6
MACH 1	3	3	2	5	2	1
MACH 2	4	1	1	2	2	1
MACH 3	2	2	5	1	1	2

Along with this you need to know the time it takes to process each part on each machine. Characteristics of machines and parts result in differences in processing times. The most efficient machine for making one part is not necessarily best for another. Table 2 at the left tells you how many hours it takes to process each part on each machine. The big problem is knowing how to use this information to arrive at the best possible schedule.

You might try to work this out yourself in the space available in Table 1. Cover up the solutions and see how close you come to the right answer. To find how near you get to the available hours on each machine, simply multiply the units you wish to schedule by the appropriate hours per unit derived from Table 2.

Table 3 is an example of one schedule for producing all the parts. It is a trial-and-error solution, and requires 390 machine-hours instead of 270. You may have done better. Many schedules could be devised by traditional methods—but usually they'll require extra machine-hours.

The ideal solution appears in Table 4. It provides for completion of the entire job in the available hours of machining. This schedule was arrived at by linear programing. It was obtained by a step-by-step procedure that started with the setting up of the original table. A trial solution was first made according to the prescribed rules of linear programing. Then the trial solution was tested with a routine that incorporates the values of hours per unit in Table 2. The entire procedure requires only the use of simple addition, subtraction, and multiplication.

SOLUTIONS

TABLE 3

	UNITS						AVAILABLE MACHINE HOURS	SCHEDULED MACHINE HOURS
	PT 1	PT 2	PT 3	PT 4	PT 5	PT 6		
MACH 1		40	10				80	140
MACH 2			30				30	30
MACH 3	10		20	20	20	30	160	220
PARTS REQ	10	40	60	20	20	30	270	390

TABLE 4

	UNITS						AVAILABLE MACHINE HOURS	SCHEDULED MACHINE HOURS
	PT 1	PT 2	PT 3	PT 4	PT 5	PT 6		
MACH 1			30			20	80	80
MACH 2			30				30	30
MACH 3	10	40		20	20	10	160	160
PARTS REQ	10	40	60	20	20	30	270	270

If you had a problem this simple, you could do very well by trial-and-error scheduling. But you can see that, if the number of machines and the number of orders were increased, the problem would become very complex. That's when you might want to apply linear programing to obtain better schedules.

Linear programing is an outgrowth of work done with the Air Forces on Project Scoop. This work (often called input-output analysis) was done to demonstrate quantitatively the dependence of various industries on one another. It shows what orders for key products take in the way of finished goods and materials from other industries. Factors like labor, critical materials, or manufacturing space could also be analyzed in this way.

Linear programing goes beyond input-output analysis because it tries to relate these factors in some optimum way. Research by many mathematicians has produced some powerful program-

ing tools, that, wnen simplified, will provide you with methods of producing better schedules of interdependent factors.

A few other industrial problems that are being solved by linear programing:

- Product mix that will result in greatest profit.
- Scheduling work for lowest labor cost.
- Scheduling warehousing for lowest shipping costs.
- Job classification to guarantee most equitable compensation.
- Plant layout for minimum material handling.

QUEUING (WAITING LINE) THEORY

A line forming in the plant cafeteria might give you a "queuing" or "waiting line" problem. But a lot of production problems like parts waiting for inspection, machining, or assembly also fall into this category.

Queuing theory makes use of probability laws to relate the capacity of your equipment to the number of parts you may have waiting to use that equipment. It will help you decide the most economical way to correct these bottlenecks.

Here's an example to show how one waiting line theory might be applied in your own plant. As an oversimplified case the formula has many restrictions. But it might shed some light on the newer methods of attack.

Suppose there's always a line of machinists waiting at the tool crib for service. Valuable production time is being lost and you want to do something about it. So you make a study of the number of men who come to the tool crib every day, and the number of minutes it takes to service each man.

This information (which could be obtained by statistical sampling procedures to save time) gives you all the data you need. You examine the data and find that these men arrive for service at the tool crib in a random fashion—independent of one another. Furthermore, over any given time interval of sufficient duration, approximately the same number of men arrive for service.

To the scientist this implies a special kind of waiting line, enabling you to use a simple formula to determine the probable waiting time:

$$W \text{ (expected waiting time) equals } \frac{s^2 + S^2}{2\,(a - s)}$$

In this formula, a is the average arrival time interval and can be calculated from the average number of people arriving at the crib for service each day. Suppose you recorded 120 machinists arriving per day. Then a would be 4 minutes per arrival, or 480 (number of minutes in an 8-hour day) divided by 120.

The average time it takes to service each customer is s. Say you found this to be 3 minutes, but the service varied considerably from one customer to another. This variation is taken into consideration by S—which is technically the standard deviation from the service time s. Let's assume this turned out to be 1 minute.

By using this information you can predict the probable waiting time for a random customer at the tool crib. (But remember that this formula only holds good for the restricted conditions of this particular problem.)

$$W = \frac{(3)^2 + (1)^2}{2\,(4-3)}$$

$$= \frac{9+1}{2 \times 1} = \frac{10}{2} = 5 \text{ minutes}$$

This means that the average machinist arriving at the tool crib will have to wait 5 minutes before he gets any service. Suppose you wanted to know if you could justify putting another man in the crib to improve service? You try it for awhile and observe results. Service improves so that one machinist is taken care of in 2 minutes instead of 3 minutes. This changes s in the above formula from 3 to 20. Let's see what effect this has on the expected waiting time.

$$W = \frac{(2)^2 + (1)^2}{2\,(4-2)} = \frac{5}{4} \text{ or } 1.25 \text{ minute}$$

This shows that the expected waiting time is reduced considerably by a slight improvement in service, which is often the case. By saving 120 people each (5 – 1.25) or 3.75 minutes, a total of 7.5 man-hours a day would be saved. If your machinists make much more than the tool crib attendants, it probably pays you to add the extra man to the tool crib staff.

A problem this simple would probably not justify operations research. However, large-scale problems of this nature where the pay-off is great may be worth tackling by some of these methods.

SYMBOLIC LOGIC METHOD

This is a cross between intuitive judgment and logical analysis, often using a half-mathematical shorthand notation. It is practised in one form or another by people making decisions in a very objective way. Here we use letters for symbols.

One manufacturer knew it could produce a certain three-piece mechanism better at less cost by redesigning. The problem was to decide which metal to use for each of the three parts. One piece could be made from six materials, another from five, and the final part from three. Mathematically, 90 possible new combinations should have been developed for testing and evaluation. Since research and development of all these mechanism combinations would have been too costly, another means was sought to find the answer.

The engineering department found that certain combinations of materials created frictional or electrical characteristics that could not be tolerated.

Turn the page

A list was prepared of the restrictions to be placed on combinations. For example, if metal *A* were the first component, then metals *D* or *E* could not be used for the second, and metal *J* was unsuitable for the third. Similarly, if metal *B* were the first component, then metals *D* or *E* could not be used as the second, and *H* was unsuitable for the third. The full list of undesirable combinations was supplemented by another list of expected performance characteristics of the components. An hour's logical analysis of these restrictions eliminated 73 of the 90 combinations.

The cost accounting department then calculated production and material costs for the remaining 17 combinations. By comparing these with the present costs, another 15 combinations were deemed unsuitable. That left only 2 combinations to study. The problem of developing and testing them before making a final choice was simple, compared with the perplexing problem of 90 combinations the company first faced.

GAME THEORY

Game theory is a science that is based on probability rules—you determine ways to play against an opponent so as to minimize your chances of losing. Some scientists think that when it "grows up" it will offer some useful rules for outguessing competition. So far it has been applied to simple games against one opponent.

One rule is: If you are playing a game where each turn involves two choices (like guessing heads or tails in coin matching), your best strategy is to play the game completely at random. That way you minimize your chance of losing and should win 50% of the time—no matter what strategy your opponent uses.

INFORMATION THEORY

Formulas have been developed by people in the communications field to determine the amount of information that can be sent over transmission lines. These theories are appropriate in determining the amount of coded information a system can handle. They'll be important to people developing electronic systems for handling your paperwork. But some operations research experts feel they can be applied to measuring the effectiveness of plant operations.

SEARCH THEORY

Theories of search relate to the probability of finding what you are looking for. They make use of one type of probability theory—were applied mostly during the war to determine probability of sub sinkings and aircraft encounters. Yet there may be applications in industry, too.

AUTOMATIC FEEDBACK CONTROL

Feedback principles are used in the design of controls that must maintain a specified relationship between one variable and another. The variable you want to control is compared with the other, and any differences are fed into the control system which acts to bring your variable back in line. A servomechanism is a special kind of feedback system that controls the mechanical position of one element.

Many operations in business are analagous to feedback control systems. Operations researchers feel they can apply design principles used in these systems to some of your plant problems. (If you are interested in learning more about feedback controls, see the article beginning on page 106.)

METHODS FROM OTHER SCIENCES

This article has only touched on the subject of mathematics. Operations research draws on many formulas and laws developed in the various physical sciences, too. Formulas for the expansion of gases, density of fluids, and acceleration of atomic particles can be used when they have an analogy to management problems. Even more practically, scientists look to such standard mathematics as algebra, calculus, and geometry for help in solving your problems.

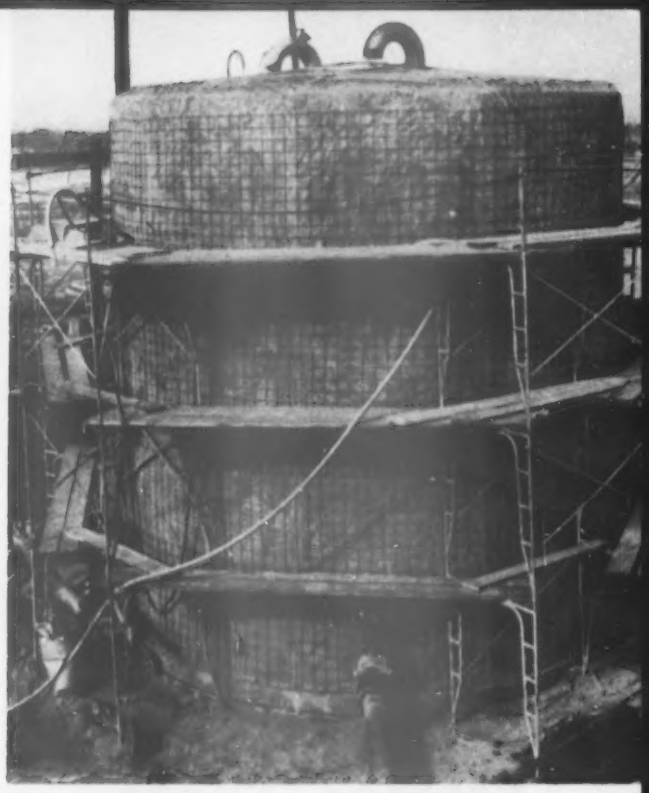
For Operations Research glossary see page 238

Want to find out more about operations research?

In an early issue we'll tell you how some companies are already using it.

You'll want to read about their experiences before deciding what's in it for you.

BASE COAT OF VERMICULITE, 3 inches thick, is blown on steel surface of 80,000-gal. tank used to store creosote at 230F.



FINAL COAT, a ¾-in. skin of regular sand concrete, is ready to be applied over insulation and wire mesh.

Now—a brand-new . . .

Concrete Coat for Outdoor Tanks

LOOKING FOR A GOOD WAY to insulate and fireproof your big steel outdoor storage tanks?

A 3-in. coating of blown-on vermiculite concrete answers all requirements for Valentine Clark Corporation, St. Paul. Here's how:

• **It keeps the heat in.** One February week-end the heat to the tank was turned off entirely. But by Monday morning, only 50F of its original 230F had been lost—with a temperature of 8 below.

• **It's inexpensive.** The job took only eight working days—much less than would have been needed with other insulating materials. It cost less than the lowest quotation for non-durable insulation.

• **It's strong enough** to withstand occasional accidental blows. With the sand concrete outer coating, it takes a big knock to damage the shell.

THE OLD WAY • The storage tanks—24 feet in diameter and 25 feet high—contain creosote at 230F, used to impregnate electric light and power poles. Up to now, the tanks had been insulated with materials held in place by wire or steel strap. This didn't work very well:

• When the ties rusted out, the insulation sagged or bulged, eventually broke open.

• The insulation couldn't withstand accidental blows from the heavy poles that are moved about the yard by locomotive crane.

• The material wasn't completely fireproof. In a recent fire, one of the tanks was destroyed.

THE NEW WAY • The steel tank was heated to maximum so the concrete wouldn't crack later when the metal expanded. A coat of vermiculite, 3 inches deep, was blown directly over the steel in one operation, using about 15 pounds of air pressure. Canvas, spread around the base of the tank, caught the insulation that rebounded. It was dry and could be shoveled up and returned to the hopper. A 1:12 mix (one part Portland cement to 12 parts vermiculite aggregate) was used.

As each section was completed, the concrete was evened up with a curved piece of plywood cut exactly to the 7-ft. radius between vertical screeds. This was handled by one man on each side. When the concrete had set, the screeds were removed and the space they had occupied was blown to the 3-inch-thickness. Then a 6x6x10-gage wire mesh was bound to the tank. And a ¾-in. finish coat of sand concrete was applied for wearing surface.

$32,000 investment in...

Five-High Stacking Gains 98,000 Sq. Ft. of Storage Space

By JAMES T. HANLON • Production Manager
Nordberg Manufacturing Company
Milwaukee

WE RECENTLY COMPLETED a program of palletizing our warehouses. It increased our 24,500 sq. ft. of warehouse capacity five times—since we now stack five high. If we hadn't made use of modern handling techniques, we would have needed a new warehouse with an area of about 98,000 sq. ft. At $10 a sq. ft., the building would have cost $980,000.

To utilize our formerly unused area, we bought about $32,000 worth of new equipment: two gasoline forklift trucks, three electric stackers, three electric low-lift pallet trucks, a battery charger, and 2500 42x48-in. wing-type pallets. All pallet racks were made from scrap material by our maintenance people.

Now we use all the newly-created space. We're storing more than twice as much material. We've eliminated the use of a second warehouse 20 miles from the plant. We've made 1900 sq. ft. of former storage space available for badly needed production space. And we've transferred 15 employees from the storeroom and yard to the production floor.

Turn the page for pictures of Nordberg's palletizing methods with odd-shaped parts or by building its own pallets, fixtures, or racks.

BEFORE

SUBSTITUTING PALLETS

SKIDS TIED UP in storage (above) created shortage of skids for in-plant transportation. So company placed order for 250 skids at $5363. Nordberg later canceled that order and solved the whole problem with $625 worth of pallets.

PALLETIZING ENABLED

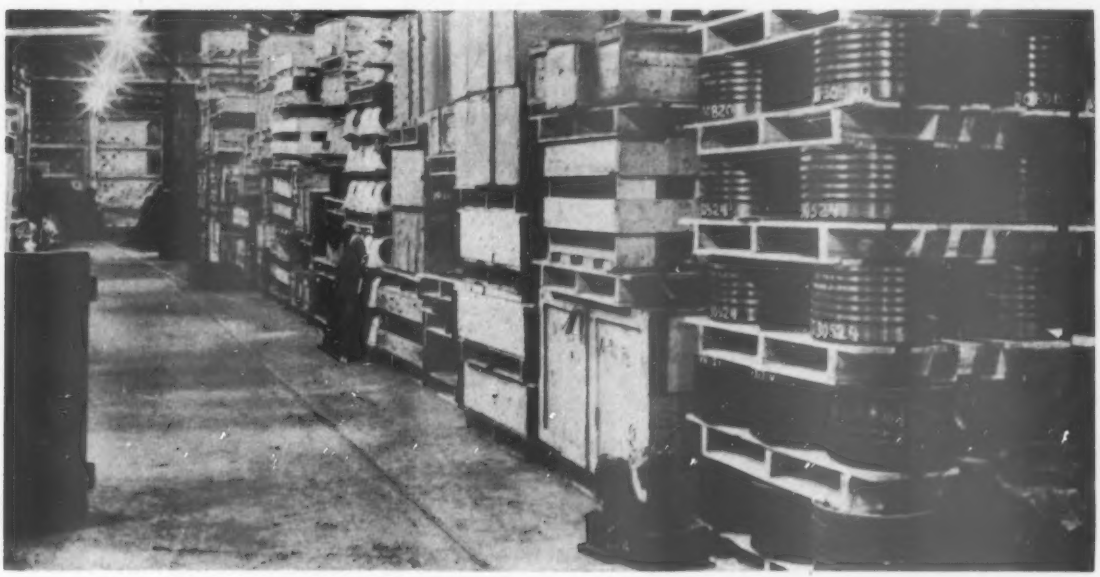
AIR SPACE IS WASTED in this 2100 sq. ft warehouse area. Manual stacking put limit on weight of items, stack height.

AFTER

FOR SKIDS SAVED $4738, IMPROVED HANDLING

DAMAGE LESSENED as well as space saved here. Gate valves formerly stored on floor were often damaged or misplaced. Pallets now form protective "packages" for the valves, improve housekeeping. And release 2000 more square feet for storage.

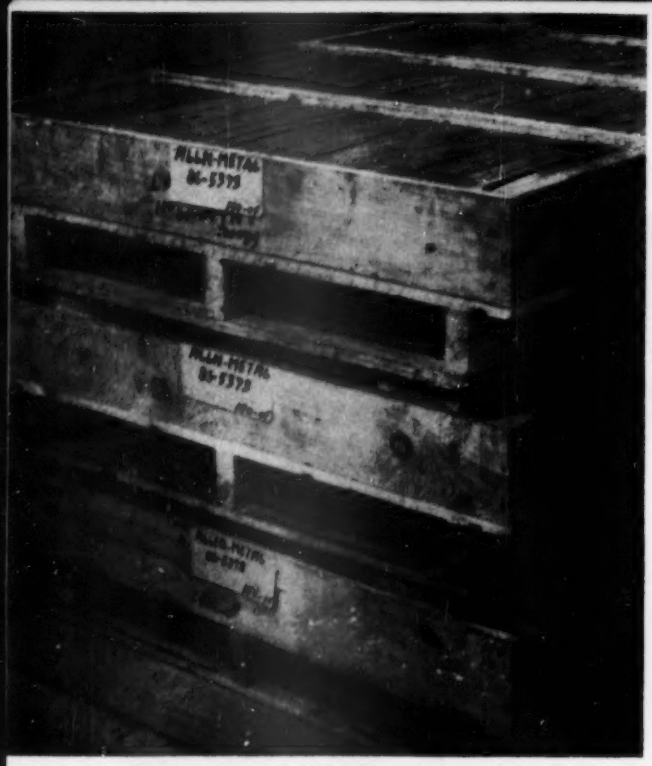
EASIER HANDLING, TOO • Stacker enables one man to handle entire pallet. A 7-ft. aisle is plenty wide enough. And stacks can be 9 feet high plus height of top load. Use of racks eliminates unstacking to get items at bottom of pile.



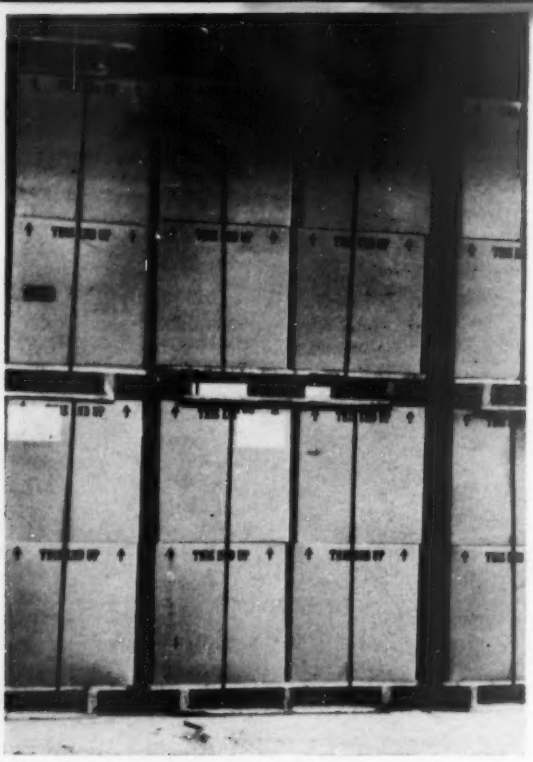
US TO MAKE BETTER USE OF AIR SPACE

AIR SPACE FULLY UTILIZED in same area after palletization, enabled us to more than double our effective storage area.

And with individual items far more accessible and inventory taking much easier, added savings are obvious.



ODD-SHAPED METAL SEGMENTS are delivered from the vendor in special pallet boxes. They're self-counting, and are used for storage and transportation. Metal segments used to arrive at the plant loose, had to be counted, placed manually on a skid, transported to warehouse, unloaded, and later reloaded to deliver to production. Even without packaging by vendor, placing parts in boxes at shipping would have saved time, effort.



GASOLINE ENGINES that defied palletization are now received in these palletized cartons through the cooperation of the vendor. Cartons and pallets are returned to vendor when unloaded at point of use. This was final step of development. Engines at first were received loose, hand stacked, and required 560 square feet, much handling. Now, as above, they're stacked in only 140 square feet, need a minimum of handling.

Begins on page 122

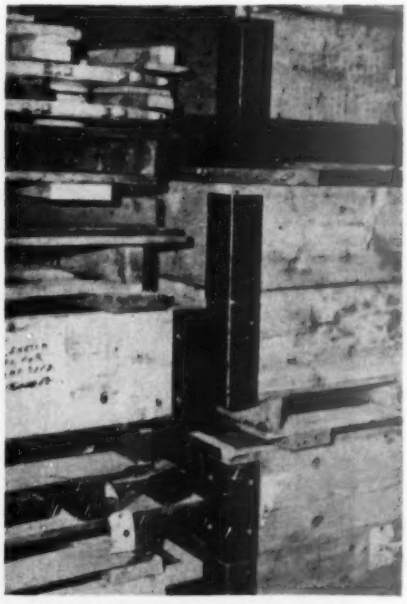
Palletizing the Unpalletizable

PHOTOS ABOVE:

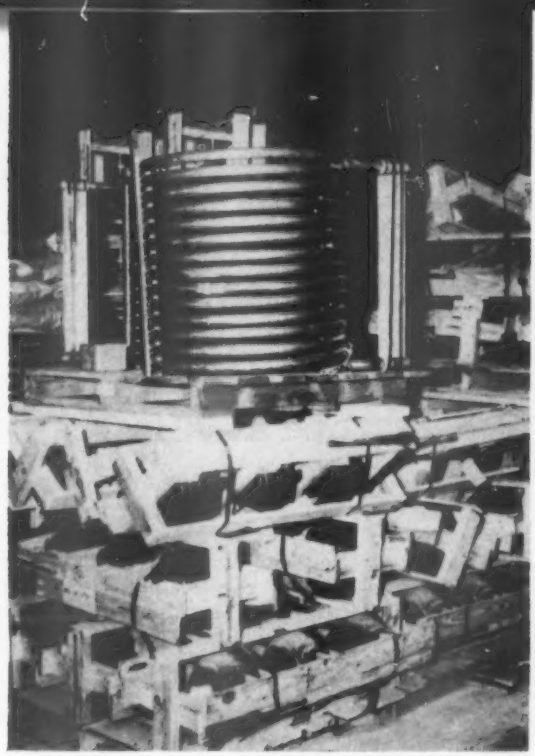
Either Nordberg gets vendors to cooperate by supplying odd-shaped parts specially packaged for easy palletizing . . .

PHOTOS AT RIGHT:

. . . Or Nordberg builds its own pallet boxes, special fixtures, or racks to handle the irregular-shaped items in its warehouse.



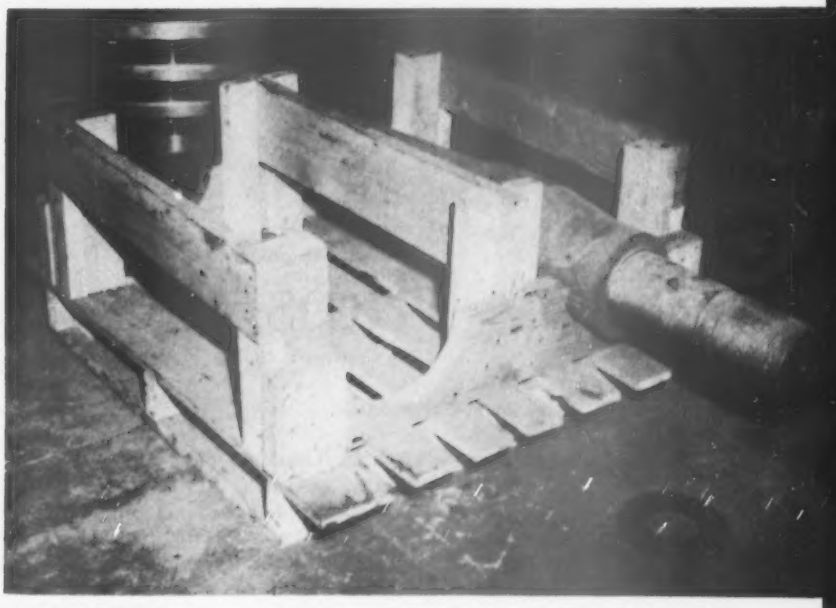
SMALL, LOOSE ITEMS are stored in these home-made general purpose pallet boxes. Side boards over pallet form box. Two, three, or even four side-boards can be used to make different height boxes.



COILS AND CLUTCHES — odd-shaped and easily damaged— were palletized by Nordberg as above. Copper coils can only be stacked on "top shelf" of a stack of pallets. The clutches stacked under the coil were round in one dimension, had a shaft protruding from either end. Vendor packaged them in an X-shaped bracing, four in line. By staggering position of the braces, compact pallet loads were developed for the clutches.

SPRINGS are palletized by vendor for $3 a pallet, easily paid off by elimination of manual handling and loading. For years Nordberg stored springs lying on side and strapped to a skid pyramid style. Since top of load was narrower than bottom, no stacking was possible. Now two parallel surfaces are utilized. This gets most out of pallet space, makes possible pallet stacking. Principle can be used with many cylindrical objects.

Note that corner angles extend below board for interlocking. Method is used for any small, loose items, such as small, irregular castings; or for crushable items, like small sheet metal fabrications.



CRUSHER SHAFTS, heavy and tapered, are stored on these Nordberg-built racks. Shafts did not lend themselves to any other method of palletizing. Such special fixtures are obviously special-purpose, are used as a last resort. Again note heavy corner posts to make stacking possible. Nordberg builds such specials only where there is a relatively continuous need for the part.

A TOBY QUINT EPISODE:

"... a fellow has to develop a sense of life. A healthy discontent is a wonderful thing."

Toby Maps the Road Ahead

By RAY W. SHERMAN

WHENEVER Chuck Farr, industrial engineer for Central Manufacturing, saw Plant Manager Tobias Quint walking about the factory floor, Farr was sure of one of two things:

One—Toby wasn't overly busy. Two—he had so many troubles he had ditched them all and gone out to "smell the plant" where he had begun on a bench when the business was very young.

In either case, it would be a good time to see him. If Toby had no troubles, he wouldn't mind some. If he were buried in them, one more wouldn't matter. Whereupon, as soon as Toby headed for the offices, Farr eased briskly on his trail and popped in with a cheery: "What! No troubles?"

"Oh, no." Toby, hands in his pockets, kept looking out the window. "Treasurer's in a tax jam. Apex is going to sue for infringement. Green Stores claims an easement on our warehouse lot. New York branch had a fire yesterday. Old man's in Biloxi. Going to rain. Forgot my rubbers."

Turning back to his desk, Old Toby began packing a battered corncob pipe.

"If *you* have some trouble, Chuck, it will simply round out my day."

"I'll do my best." Chuck laughed. "It doesn't look as big as it did. But—it's big—in a way."

"They're all big!" Toby's wrinkled face grew grim, then softened. "And—all little!"

"It's come up before," said Chuck. "Now it's a bit worse. Henry Bagley wants to quit."

"Henry's a good engineer." Toby finally got the corncob going. "What gives?"

"He's been asked to be industrial engineer for Horton Products."

"Chuck!" Toby's lids narrowed. "I think he ought to take it! Horton isn't very big. Henry's young. It's a chance for him. About all we can do is bid him godspeed and tell him if he doesn't like it we'll be glad to have him back."

"I did that." Chuck's brows knit. "What bothers me is what to do about some of the others. They get itchy. Want to know what their future is. It's nice to have ambitious guys around. I wish they were all like that. But it's hard to keep them that way if they feel there's no hope."

"It's a problem, Chuck." Toby rocked back and puffed. "Always was. Always will be. Wasn't it Napoleon who said every soldier carried a marshal's baton in his knapsack? I suspect some of the knapsacks got a bit heavy after a while."

"Millions of soldiers." Chuck studied the snow that was starting to fall. "Only a few generals. Only one Old Man. Only one Plant Manager."

"That's all!" Toby shrugged. "Some day somebody will get my job, but not for a while—I hope. And only *one* guy can get it. You know, Chuck—" Toby began exploring the sudden reluctance of his corncob "—a fellow has to develop a philosophy of life. It's hard when you're young. If you're ambitious, you dream of the top. You don't figure you can be happy otherwise. A healthy discontent is a wonderful thing. And so—you have problems.

"What you've got to sell these lads—if you can—is to keep on being ambitious, do the best they can with the jobs they've got, keep studying and working, be good soldiers, be qualified for a better job if one comes along, not rush things, not become disgruntled, be willing and cooperative, and not jeopardize their chances."

"That might be hard—for some of them." Chuck's mind ran over his list of men.

"But those are facts," said Toby. "You can tell 'em, too, that nobody can foresee the future. This plant may grow. Men higher up the ladder may go. Eventually they all will. In a plant like this, there are bound to be opportunities we can't foresee even a day ahead. Some day we might reshuffle the whole deck. There might even be need for one of your men in some other department. It's swell to aim for one job, and one day get it. But generally progress comes from being ready for opportunities when they arise. I had four jobs before I got to be a foreman."

Toby blew through the overhauled pipestem.

"You also can tell 'em it's better to be not so high up in a good company than higher up in one not so good. And—" Toby eyed Chuck "—only a few in this country are what we call 'rich.' But many are happy. They did the best they could, always. And when a chance came they were ready. They did pretty well, too. They—"

Toby reached fast for his ringing phone. He listened. His leathery wrinkles became all smiles. Hanging up, he said:

"One of our trucks just hit a pig out on Route 20. Jack Dean said he thought I'd like to know. *And that—*" Toby laughed "*—rounds out my day!*"

"Quite a problem—isn't it?"

"Problem?" Toby's eyebrush lifted.

"We pay for the pig," said Chuck. "With the price of pork—who gets the pig?"

"Wait!" Toby grabbed the phone and began furiously dialing the plant engineer's number.

DONALD C. McGRAW was elected president of McGraw-Hill Publishing Company, Inc., on September 18. He succeeds his brother, the late Curtis W. McGraw.

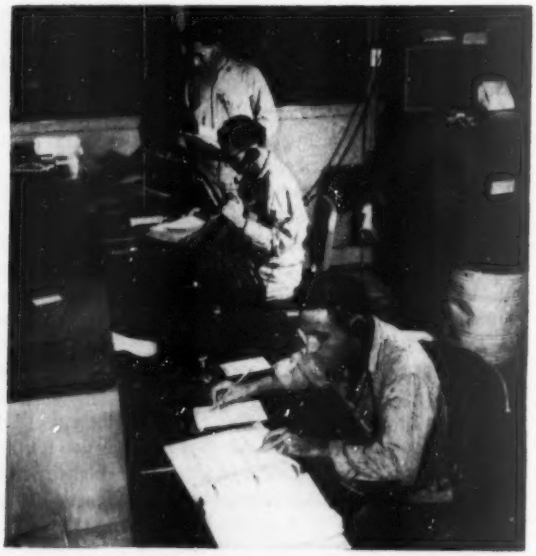
Mr. McGraw, youngest son of the late James H. McGraw, Sr., founder, joined McGraw-Hill in 1919 as a member of the advertising staff of *Chemical & Metallurgical Engineering*, which has since become *Chemical Engineering*.

Since 1933, when he was made secretary of the company and put in charge of production and manufacturing, he has been responsible for the handling of all contracts for printing and binding, engraving, and paper supply for the entire McGraw-Hill operation.

In 1945 Mr. McGraw was named vice-president for manufacturing and general services, the position he has held until now. In 1950, he became a director of the McGraw-Hill Book Company, a McGraw-Hill subsidiary, and of the Newton Falls Paper Mill in which McGraw-Hill has a half-interest.

THREE TRACTOR-TRAILER TRAINS MAKE 33 STORES-TO-JOB DELIVERIES DAILY AT ETHYL'S BATON ROUGE PLANT

INCOMING MATERIAL is palletized and moved to the checking-in station for item classification. About 100 receiving slips (averaging 10 items apiece) are processed daily.



THREE PHONE ORDER CLERKS write up some 500 orders daily on recessed register machines. General and spare parts catalogs help them identify the needed items.

Stores-to-job delivery features Ethyl's 10-point...

Program for Better Handling of Maintenance Stores

Don't let the size of this operation scare you off.
Its basic elements are applicable in any size or type of plant.
If you have a maintenance stores problem,
here are principles and practices that should help you
boost the efficiency of your entire maintenance operation.

By ALAN S. BARTON • Superintendent of Stores
Ethyl Corporation, Baton Rouge, La.

UNTIL RECENTLY we at Ethyl Corporation were in much the same position on maintenance stores as many other growing plants.

We had given them little thought. We were trying to control and dispense stock from twelve small buildings and eight indoor storage areas. Also from rented space 5 miles outside the plant.

These buildings were totally inadequate for efficient materials handling and storage. Our maintenance shops, also in scattered buildings, were similarly handicapped by inadequate handling and storage facilities. To make matters worse, consolidation of two separate operating plants had left us with two stores organizations, each a complete unit from requisitioning to withdrawal.

CENTRALIZE OR DECENTRALIZE? To correct this situation, we made a study to determine whether (1) to erect widely separated stores buildings near the operating areas, or (2) to combine all stores facilities and provide stock delivery to the job.

We decided to centralize—so put the maintenance stores in the same building with their best customer, the maintenance shops, which use about 35% of all stock.

RESULTS • After almost two years' experience, we don't hesitate to say we're more than pleased with the success of our completely integrated maintenance stores at Baton Rouge.

By "integrated" we mean not only the control of stores material and equipment from receipt to use in the field. We also mean full control of both material and equipment from authorization to scrap.

Benefits have been big and numerous. In conjunction with centralization of shops and a daily scheduling system (see "Daily Maintenance Schedules for 1000 men in 15 Man-Hours," FACTORY, October 1952) we have made a 10% savings in maintenance manpower. Losses from stock deterioration have been greatly reduced, because more stock is under adequate cover.

And more. The centralization of stores facilities has greatly simplified our materials handling problem. Better inventory control has reduced total stock items and cut losses from obsolescence. There's no waste of unused or salvageable material, because it is routinely returned to stores. We have achieved less duplication of stock, and obtained maximum use of floor storage space with more flexibility of storage.

That's still not all. We have secured the added advantage of lower construction and maintenance costs by delivery of stores material to the job.

There are other specific benefits—you'll read about them in the pages following.

TO SUM UP • We don't want to imply that our stores system is perfect. Wrinkles still need ironing out. But our stores operations are far better than three years ago. And we intend to continue our study of materials handling equipment, of controls to eliminate duplicate and obsolete stock, of up-to-date paperwork. These are areas in which we foresee still more progress.

For Ethyl's 10 steps to better handling of maintenance stores, turn the page

Begins on page 128

10 Steps Ethyl Took to Improve Its Stores Operation

1
It reorganized the stores department

All stores were placed under a single superintendent, who reports to the manager of maintenance and construction on the same level as the three superintendents of the maintenance, construction, and power functions. Thus the manager is able to give equal consideration to all four groups, and to evaluate clearly the savings found in sound inventory control without harmful depletion of necessary stock.

The superintendent of stores has under him a supervisor for each of three groups: (1) materials handling, (2) standardization and inventory, and (3) receiving and office.

Supervisor No. 1 handles three subdivisions, each headed by a salaried foreman, as follows: (1) phone order, assembly and delivery (25 men); (2) stock foreman (15 men); and (3) outside foreman (10 men).

Supervisor No. 2 manages a standards engineer as staff, and one inventory foreman with seven inventory clerks. No. 3 has two foremen over receiving and shipping (20 men) and office (11 posting clerks). Total personnel—not including secretary to the superintendent, 1 typist clerk, and 2 laborers—is 99.

This stores group serves our maintenance organization of 1311 people. It also handles all plant stores (except office materials and supplies) as well as process materials and supplies. But its primary job is care of maintenance stores, requiring 76% of the time of its personnel.

2
It minimized handling in the maintenance shops

Two years ago we moved "central stores" into 72,000 square feet of a large single-story building (140,000 square feet) containing "central shops." This building is equipped with all modern facilities for the efficient handling of a variety of some 28,500 items. They range from small wood screws to large heat exchangers and conveyor flights.

Five overhead cranes service both stores and shops. They provide a one-time handling of heavy materials from stores issue to work table.

Heavy materials and equipment are palletized and stored on pallet racks. Raw materials also are palletized and stocked in heights consistent with good storage practices. Small materials go into bins in an area so arranged that most-used classes of items are closest to the dispatching area. This saves time in stock picking.

3
It established major classifications

Early in the game we had classified our stock requirements and set them up in six major alphabetical groups as follows: (A) pipe and pipe fittings, (B) maintenance materials of general nature usable in all portions of the plant, (C) general spare parts for specific equipment usable in any part of the plant, (D) and (E) spare parts for equipment used only in specific departments, and (F) various materials, generally not maintenance items.

Each of these six groups is subdivided by a series of numbers into more explicit classes. For example, in group A, class number 4 covers Pyrex pipe and fittings; class number 8 covers rubber-lined pipe and fittings. Group B begins at number 13, C at 33, D at 47, and so on. Each group has stock class numbers in reserve for future expansion. Although only 45 classes have been assigned, stock classes are now up to 61.

We believe these classifications are essential to the efficient operation of any maintenance stores. They simplify ordering, storing, recording, disbursing, costing, and so on. We use a six-digit number for all stores stock. The first and second digits show in which one of the main classifications the item falls. The last four digits are used to define specific items, and are never used twice.

In other words, a certain number always means the same thing, no matter what you call it. This number travels through every phase of central stores operations—from requisitioning to purchasing, to vendor, to invoice checking, to bin storage, and to the field through catalogs.

4
It provided delivery service to field areas

Although we "centralized" our maintenance stores as to function, actually the building is located in the far northeast corner of the plot, and as much as a mile away from some operations. So we set up a tow-train system.

We make fast deliveries to 32 conveniently located delivery stations by three tractor-trailer combinations, operating on 30-min. schedules over two routes. One tow train covers one route of 1.6 round-trip miles. Two tow trains cover the other route of 2.25 miles. The delivery stations are simple 8x10-ft. steel frame structures with Transite (asbestos-concrete) roofs and open sides.

During the first 19 months of operation, we delivered over 220,000 orders to the field. (We now average 33 deliveries of about 500 orders per day.) In that same period our "counter sales" to the maintenance shops were 190,000, an average of 385 per day. We processed 61,000 work clothing orders, averaging 143 per day.

5
It issued catalogs to fit area needs

Before we could operate the delivery system, we needed to make it easy for the foreman or craftsman in the field to telephone his order to stores. We discarded as too cumbersome the idea of reproducing an entire catalog of some 28,500 general stores items. We felt this volume would discourage craftsmen from using the books. Also they might even then not find what they were looking for.

There was also a problem of nomenclature. We already had the system of stock numbers assigned by stores personnel. But craftsmen were calling the same parts by different names, resulting in confusion and lost time. It seemed to us that what craftsmen really needed was access to standard descriptions of material primarily used in *spare parts* for the equipment they were repairing. So we cut the volume in half by devising a catalog around 17,000 *spare parts* only. And we decided to handle the thousands of *supply* items by having the craftsmen call for them by name, and having the stores personnel assign the proper stock number to them.

Next step was to simplify further the procedure for a craftsman to follow in identifying a needed part by number. Together with the maintenance personnel we set up smaller spare-parts catalogs by dividing the plant into nineteen work areas. These followed closely the areas already set up for maintenance. We broke down each area into the major pieces of equipment utilized, and then indexed equipment and parts within each of these major pieces.

Intricate parts needed visual aid, so we secured manufacturers' offsets and put them on a facing sheet that was numerically indexed to the actual word description and Ethyl stock number listed on an opposite page. Now a craftsman can locate the needed part in a picture, find it in the index, and get our stock number. Because he can order by stock number and brief "standard" description, we save time of both the order taker and the stock picker.

We now have 10 to 18 sets of catalogs in each of 24 volumes, totaling 341 catalogs. These "tailored" spare-parts catalogs are kept in 48 strategic locations throughout the plant, such as area "field offices" and other offices with telephone facilities.

6
It set up a dependable telephone order routine

We have three telephone-order clerks to receive orders from the field. Equipped with head sets on a telephone relay system, they write up stores withdrawal "tickets"—on an electric Standard Register machine recessed in each desk. Each clerk has a set of general catalogs and spare parts catalogs before him.

When a call comes in, the clerk asks for specific information from the craftsman to make out the withdrawal ticket. This includes his name, badge number, delivery station number; cost code; work order or project to be charged; description of spare part and part number (if not a spare part, the clerk looks up the stock number and enters it); and quantity wanted.

Stock pickers regularly collect all three copies of the orders, secure the items from the storage bins, and deliver the items by hand trucks or fork-lift trucks to the dispatch area. Here the materials are segregated by delivery station number, with the third copy (manila) of the withdrawal ticket attached. In bad weather the tickets are put in transparent plastic covers.

After the drivers return to the dispatch area from each trip, they pick up the filled orders waiting for their route and go the rounds again. The driver unloads the materials designated for each station. When large quantities go to a single

job, he unhitches a full trailer to ease transportation to the job site.

Our paperwork flow isn't burdensome: Each day the accumulation of original copies of the withdrawal tickets is sent to the stores office. Here the amounts disbursed are deducted from the perpetual inventory cards. The tickets then go to the tabulating section in the finance department for dollar runs. The second copy is kept by central stores for answering delivery complaints and statistical information.

7
It integrated the receiving of purchased materials

We have simplified the receiving and handling of purchased materials for stores by using modern forms and equipment, concentrating on specific duties, and providing convenient delivery locations.

Use of a combination purchase order-receiving form, designed as a carbon interleaved snap-out, eliminates duplicate typing and discrepancies caused by typing errors.

All purchased materials are received by central stores and delivered to the proper areas either through our warehouse and delivery system or on specially assigned trucks. The truck receiving dock is located close by the gate entrance. Freight cars are switched onto an adjoining spur. Hydraulic dock levelers on the truck dock accommodate it to varying tail-gate heights.

On receipt, material is palletized and carried by fork-lift trucks to a checking-in station. *Here each stock item is marked with the Ethyl stock number.* We process an average of 102 receiving slips daily, each averaging 10 different items.

8
It refined inventory control procedures

Central stores is responsible for keeping an adequate supply of maintenance materials consistent with good inventory practice. The heart of this control is in the stores office, with its use of the perpetual inventory card and the traveling order card—one set for each of 28,500 items kept in maintenance stores.

PERPETUAL INVENTORY CARD · This is pretty much like the card used in many other plants. It shows the re-order point, re-order quantity, unit package, description, and stock number. On it are entered all receipts and withdrawals, and an on-hand balance is maintained.

After our previous use of maximum and minimum control based largely on guesswork, we believe that the use of the re-order point and re-order quantity is a sound method of inventory control. Our re-order point is based on an analysis of (1) the past-usage history over a normal, 12-month period, and (2) the average procurement time, plus (3) a safety factor to cover a sudden change in either of these rates.

Our re-order quantity is determined by definite rules that consider the related influences of good purchasing practice, inventory carrying costs, and overhead expense of buying. These rules also consider the factors of source of supply, delivery dates, quantity-price relationships, usage, and storage space limitations. They have been reduced to six simple guides on a time-to-requisition basis that makes them easy to apply:

1. Bi-monthly—items locally supplied, totaling over $5 per order.

2. Quarterly—same as item 1, except not locally supplied.

3. Half-yearly or yearly—slow-moving items, used once or twice a year.

4. Monthly—heavily used items readily available, but requiring much storage space (rags, compounds).

5. Quarterly—most-used items (lumber, oils, grease) readily available, but requiring much storage space, for semi-monthly installment deliveries (to get quantity discounts without piling up physical inventory).

6. Yearly—general items (bolts, fittings) where storage space is not a factor, for installment deliveries (to get quantity discount).

This system gives us a good stock turnover (1.4 to 1.5) by achieving an over-all balance between slow-moving spare parts and heavily used general supply items.

TRAVELING ORDER CARD · We use this in place of the conventional purchase requisition form. Previously we issued about 75 hand- or type-written requsitions per day, now unnecessary.

This card is placed in the file with the perpetual inventory card for each item. Besides the stock number and item description, it has column spaces for date and quantity requisitioned, purchase order number and date, receipt date, and spaces for purchasing to designate which of vendors A, B, C, or D got the order.

Here's how it works · When the re-order point shown on the inventory card is reached, the clerk pulls out the traveling order card, enters date and re-order quantity and sends it on to purchasing. When the material is ordered, purchasing enters the order number and date, and returns the card to the stores office for filing. In time the card provides valuable historical data on quantities, dates, and vendor performance.

9
It set up a standards control for spare parts

A new spare-parts item gets into our stores initially whenever maintenance supervision sends us a "request to stock." Thereupon our standards engineer and inventory foreman study the item to see if it has already been authorized, or if it is close enough to an existing item that will serve as well.

Sometimes unwanted items get into the plant before a comparison can be made, because of lack of a manufacturers' parts list or failure to show interchangeability. When found, such items are combined with existing stock. But even with this check, we have already authorized over 3800 *bona fide* new items for new facilities.

Every newly authorized item is classified into one of the 45 groups, and assigned a stock number. With the help of a maintenance supervisor the inventory foreman establishes initial order quantity, and arranges for records and bin space. As the new items flow in, the general catalog is revised, and inventory clerks change the pages in all the spare parts catalogs around the plant.

We don't stop there. The standards engineer and inventory foreman constantly examine stock items with a view toward possible combination or substitution. Maintenance supervisors help the standards engineer decide on obsolescence of spare parts and equipment. Stock deemed obsolete is transferred to a special storage area. Central stores then initiates paperwork transferring such stock from inventory to surplus storage. In 19 months this program has already eliminated 1609 obsolescent items, and 3027 other items by standardization.

10
It set up controls over spare and surplus equipment

This step closes the circle that protects plant stock assets, by control of some commonly overlooked loopholes: (1) spare equipment, (2) surplus property, and (3) reconditioned material.

1. SPARE EQUIPMENT · Central stores makes up and maintains a history card of all spare equipment kept by maintenance. Each card describes one item (also its location) and records all its movements. At the present time we have over 500 spares cataloged. Although considered capital investment rather than inventory, this equipment is stored in the warehouse, and central stores processes all paperwork for its movement and that of the field item it may replace.

A definite procedure has been set up for the return of all excess or usable material from a maintenance job. It includes the use of a "Stores Return" tag which maintenance attaches to such material, and a credit slip which central stores sends to finance records.

2. SURPLUS PROPERTY · Central stores also has to look after other surplus company property. It examines excess material (from projects or work orders) and equipment, and takes usable items into stock to a limit consistent with sound inventory practice. The remaining material is listed as surplus. A surplus property committee composed of representatives of each department studies this list to see what can be used on future projects or as a substitute for other material. Central stores then prepares papers transferring whatever cannot be used to surplus storage. Purchasing arranges for disposal of material.

3. RECONDITIONED MATERIAL · Material deemed worthy of reclamation (such as a valve) is reconditioned by the maintenance shops and returned to central stores for issuance as new. Previously, such reclaimed material was used at no cost to the job. Thus charges for new work done did not reflect actual material costs. Also, maintenance had no way of knowing the value of its reclamation work.

It's a different story now. When a valve, for example, is no longer in serviceable condition it is sent to the shops for reconditioning, and the area pays for a replacement from stores stock. The reconditioned valve is "sold" to stores as new and added at 100% value to inventory. When the next call comes for this type of valve, the reconditioned one is withdrawn, again at full value, just like purchased material. During the first 12 months of our new set-up, maintenance has returned stock material to stores valued at $170,000.

"Every time we need to fill a key post . . .

. . . we seem to go outside the company," complained the president.
"No need," says Eugene Benge, after conducting "searches for talent" in ten companies. His conviction: A certain percentage of employees at each level in every plant are worth training for the next higher level. See "There's Talent in Your Plant" in November.

STARTED BY PITTSBURGH PLATE GLASS AS A

Major Revision of Plant Layout...

BEFORE All paintbrushes were made by small-lot methods. Brushmakers assembled parts from bench and totepans, placed finished work in totepans.

AFTER Mass-production principle of handling is applied to all large-volume brushes. (Smaller lots of high-quality brushes are still made

IT BECAME A

...Near-Revolution in Production Methods

Objectives of project: Reduce manufacturing costs and inventories; improve customer service and quality.

Results:

- *30% more production capacity, with fewer people;*
- *50% cut in order-to-shipping cycle time;*
- *70% less work in process;*
- *89% cut in distance trav-*

as in "before" photo.) Each "assembly-line" brushmaker assembles complete units. There are only three parts—ferrule, wedge, and bristles. Advantages: (1) Better bench layout and belt conveyor (at bench level under hoppers) to remove finished work saves assembly time and space; (2) hoppers for ferrules and wedges save service work.

eled through manufacturing by an average paint brush — from a previous total of 5410 feet to a present figure of 600 feet;

• *Condensed operations. Eliminated two small buildings and 23,000 square feet of rented space, added 22,000 square feet of new building. Left over for future needs is 20,000 square feet of usable space.*

DESPITE CONSTANT COST SNIPING with spot improvements, a plant accumulates disadvantages. It needs an occasional overhaul.

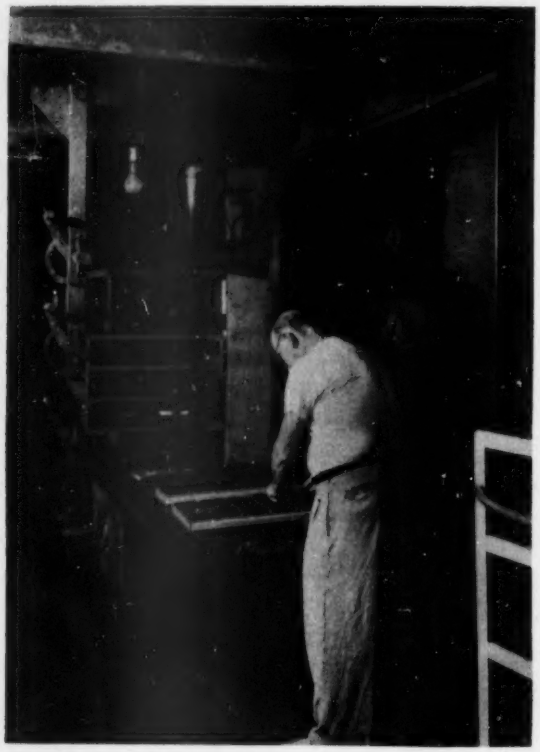
That's what happened to the Baltimore Brush Division plant of Pittsburgh Plate Glass Company. Gradual growth had spread its operations and storage throughout four buildings plus rented warehouse space.

The company decided to modernize existing buildings—to achieve its objectives at less cost than a new plant. It employed a consultant (Stevenson, Jordan & Harrison, Inc.) to do the job because its regular engineering staff had a backlog of work.

The project started essentially as a major revision of plant layout. Irregular product flow and congestion made this need obvious. Layout was improved. But gains from methods improvement stole the show.

More examples of better methods on the next page

Begins on page 134



BEFORE Vulcanizing rubber in brushes was a small-lot job. After pouring rubber into brushes, operator placed brush in a heat-resisting envelope (to protect bristles from hot totepan), then upright in totepan lined with heat-resisting material. Totepans went into oven on sliding trays.

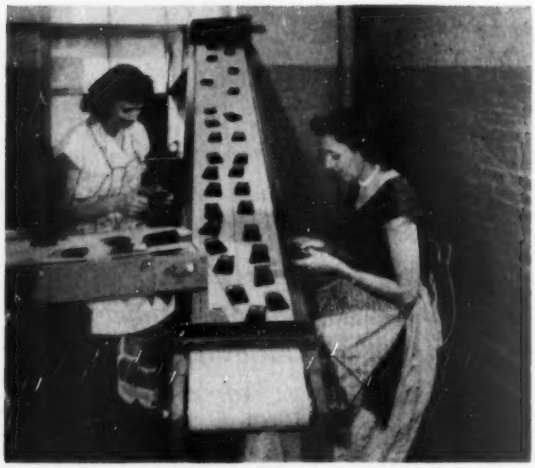
AFTER Better methods of pouring rubber and preparing brushes for vulcanizing resulted from concentrating production of larger-volume types. Operator takes brushes from end of assembly conveyor, fills them with liquid rubber by means of a fast lever-controlled valve on tank. The rubber-filled brushes

ABOVE: **Product Concentration**

AT RIGHT: **Process Concentration**

AND, ON PAGE 316:

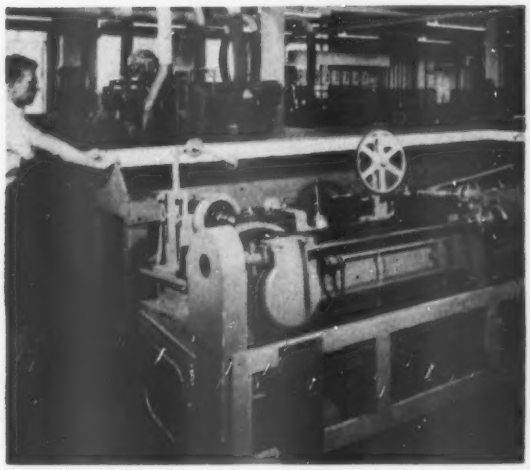
10 Steps to Modernization



CONCENTRATION OF INSPECTION at the right places improved quality, cut waste. Inspection used to separate good and bad after production had completed a lot. Now inspection is integrated with processing—to stop rejects where and when they develop. There are fewer rejects at final inspection, too.

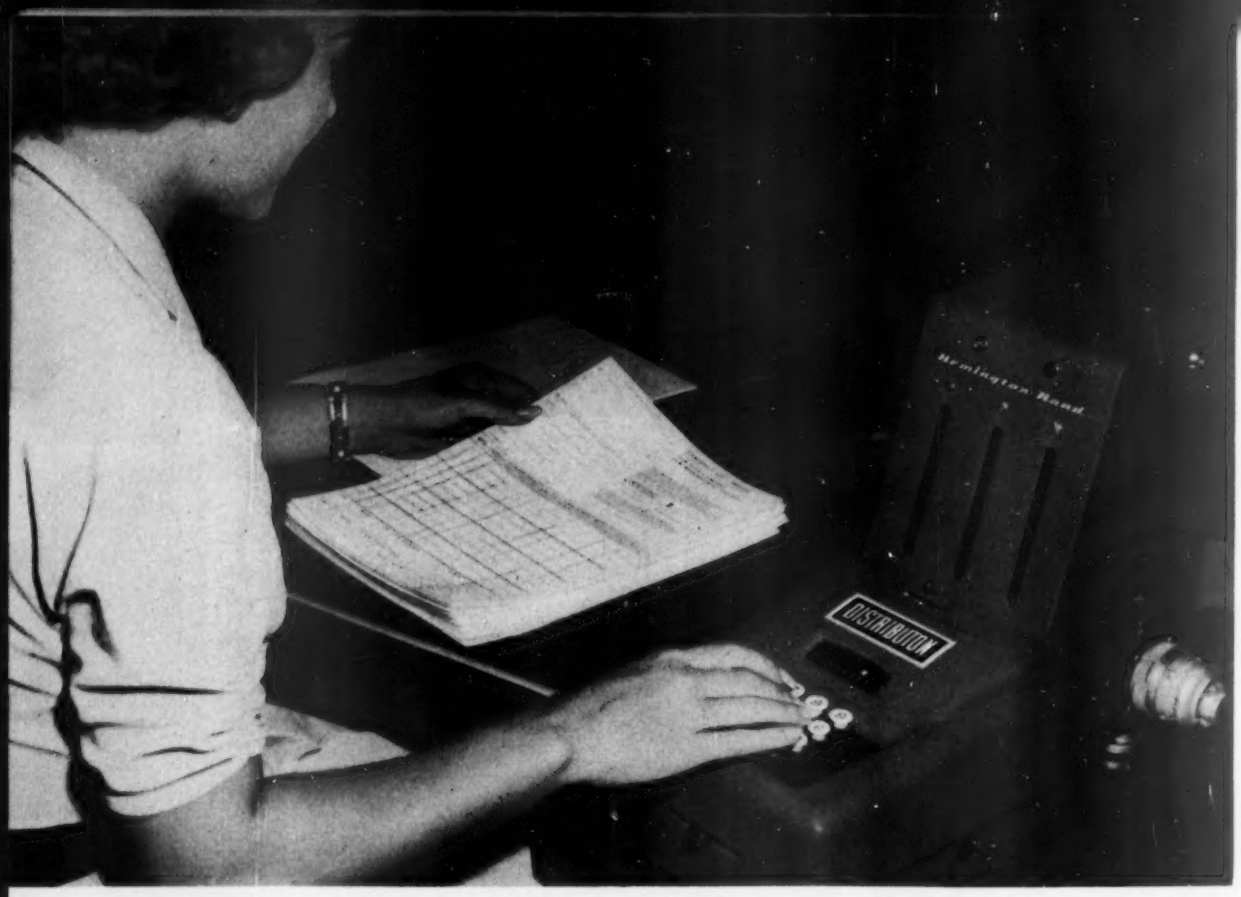
are then placed in a newly designed rack equipped with a fast-action holding device. After this the racks slide with ease into a truck, which obviously holds more brushes than just a tote-pan.

LARGER UNIT LOAD goes into the vulcanizing oven on the same truck on which brushes were placed at rubber pouring. All-steel truck withstands vulcanizing temperatures without damage. Bristles don't need protection (as before) because they're not in contact with metal. Added benefit: new oven cuts vulcanizing time considerably because the rubber is more accessible to heated air.



CONCENTRATION ON HANDLING methods led to this time, space, equipment, and labor saver. Mixing machine operator replaces empty table (on casters) with one on which layout men have placed bristle mixture. Layout men used to transfer bristles from table to totepans, which were stored ahead of mixing.

CONCENTRATION OF OPERATIONS, instead of spreading them out, eliminated much of the totepan handling between them. Even in small-lot production, space and time are saved by integrating sequential operations in which processing time is or can be nearly equal. In all, plant eliminated 3000 totepans.



NEW WAY Each girl now sits at desk with a stack of orders and Speed Tally's keyboard. She enters items with one hand and keeps her place with the other. All summarizing is done automatically.

Electronic Tally Provides

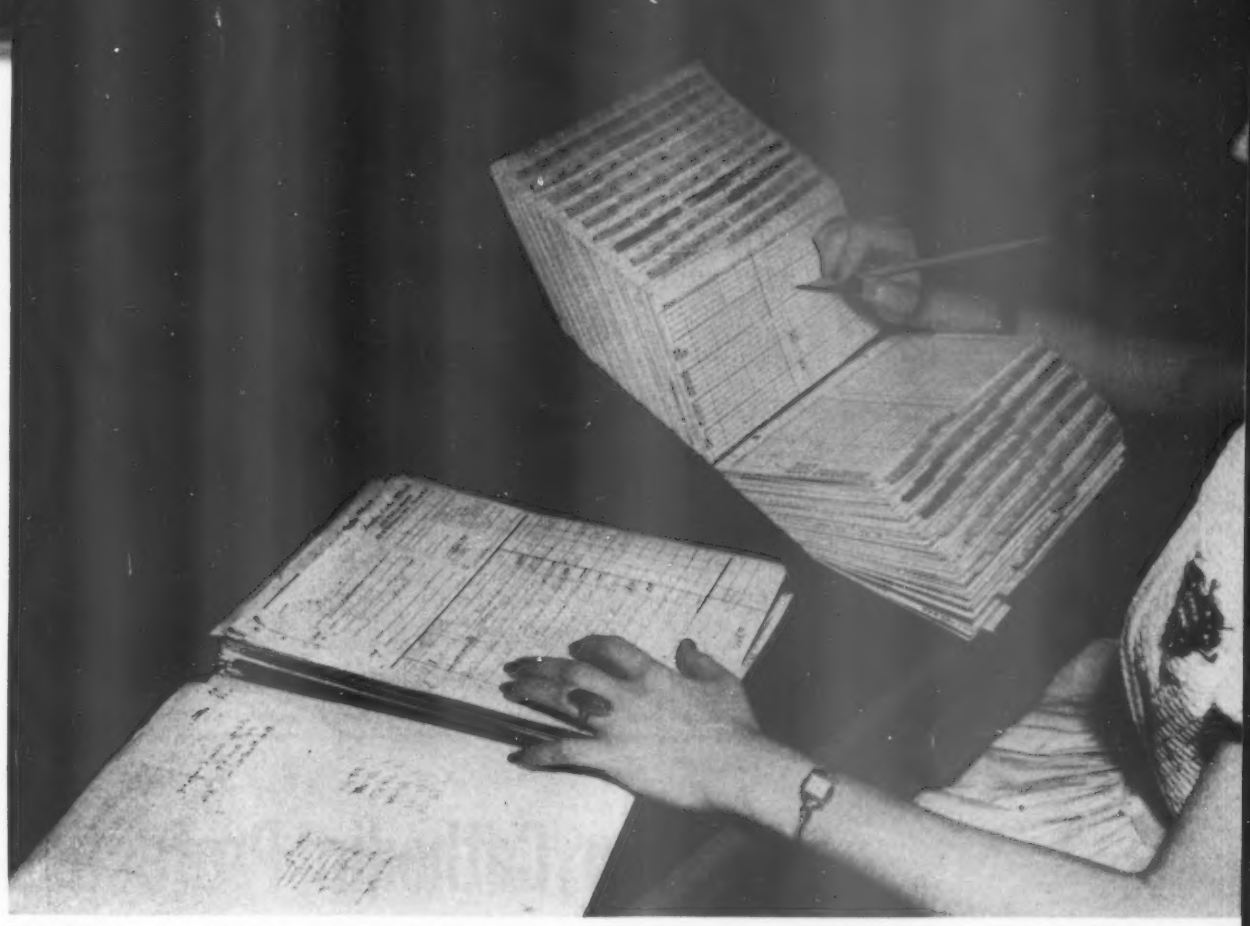
NOW IT TAKES 10 GIRLS to do the entire tallying job for John Plain. And Speed Tally's magnetic memory system can quickly provide management with a wide variety of hard-to-get inventory information that is always up-to-date.

A HIGH-SPEED ELECTRONIC DEVICE called "Speed Tally" makes inventory record-keeping nearly automatic. It was developed for John Plain & Company, a Chicago mail order house, by Engineering Research Associates, Division of Remington Rand.

John Plain sells up to 75,000 item-orders a day. It's not a manufacturing operation. But the inventory problem is the same old headache—how to keep track of thousands of items and their current quantities.

BENEFITS · Besides reducing labor required for inventory record-keeping from up to 40 girls to 10, Speed Tally makes available to John Plain the following information never before known:

- Total orders for any catalog item, correct to the instant.
- Printed record of transactions for any catalog item or items.
- Printed record of the complete inventory in less than 3 hours.

Availability of such data, says the company, will

OLD WAY Each girl had a complete catalog file in which to enter a record of each item purchased. Pages had to be turned, notations made. And the slow, tedious work of summarizing tallies frequently made reports late.

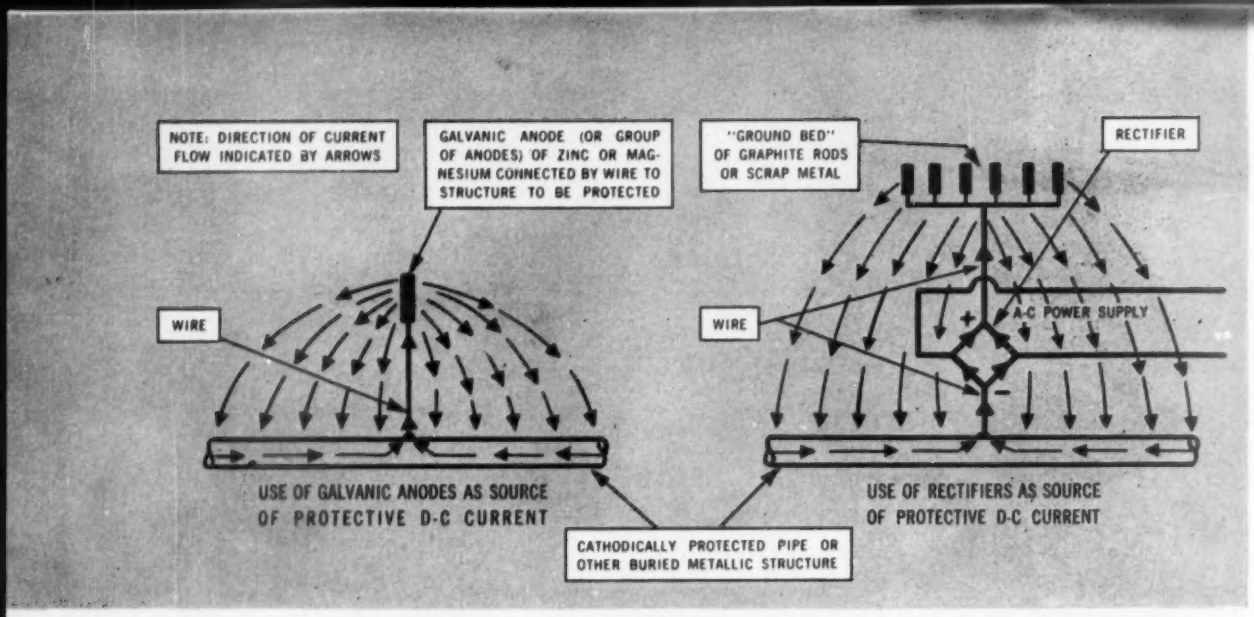
Pushbutton Inventory Control

result in better inventory control, more economical buying, and closer control of business variations. Walter H. Richter, president of John Plain, expects the Speed Tally device to more than pay for itself within a year.

HOW IT WORKS · For each item listed on the order form, the operator first enters the quantity. Then she punches out the catalog number just as she would enter a 5-digit number on a 10-key adding machine. As each item is entered, the new quantity of that item flashes in a window.

Speed Tally is built around an electronic-arithmetic device that includes a magnetic memory system capable of remembering "how many items" for each of 13,000 5-digit numbers. The machine automatically takes the old quantity off a revolving magnetic drum, adds to it the quantity entered, and impresses the new total back on the magnetic memory. All ten keyboards feed into the same system so that an up-to-the-minute summary for every item is always available.

IT TOOK UP TO 40 GIRLS to handle inventory records before Speed Tally. Just keeping track of what items were ordered took 27 girls working 8 hours. Other girls were needed to summarize the 27 individual order tally books.


NOTE: DIRECTION OF CURRENT FLOW INDICATED BY ARROWS
GALVANIC ANODE (OR GROUP OF ANODES) OF ZINC OR MAGNESIUM CONNECTED BY WIRE TO STRUCTURE TO BE PROTECTED
"GROUND BED" OF GRAPHITE RODS OR SCRAP METAL
RECTIFIER
WIRE
WIRE
A-C POWER SUPPLY
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USE OF GALVANIC ANODES AS SOURCE OF PROTECTIVE D-C CURRENT
USE OF RECTIFIERS AS SOURCE OF PROTECTIVE D-C CURRENT
CATHODICALLY PROTECTED PIPE OR OTHER BURIED METALLIC STRUCTURE

TO UNDERSTAND CATHODIC PROTECTION . . .

CATHODIC PROTECTION is really galvanic corrosion in reverse. Sketch shows how it works on a buried pipeline through the use of (left) galvanic anodes, or (right) external direct-current generator. Only the anodes have to be replaced.

How Cathodic Protection

By A. W. PEABODY • Electrical Engineer
Ebasco Services, Inc., New York City

• Are your storage tank bottoms leaking after only a few years' service?

• Did a short circuit in your underground cable reveal chunks of the lead sheathing eaten away?

• Are you having trouble with leaks in underground piping systems, radiant heating piping, heat exchangers, water heaters, cooling apparatus, and similar equipment?

• The cause may be what corrosion engineers call galvanic corrosion. And if so, the chances are good that the antidote of cathodic protection can help you, and save you a mint of money.

What Is Galvanic Corrosion?

Before you can understand the theory and application of cathodic protection, you ought to know about the basic principles of galvanic corrosion.

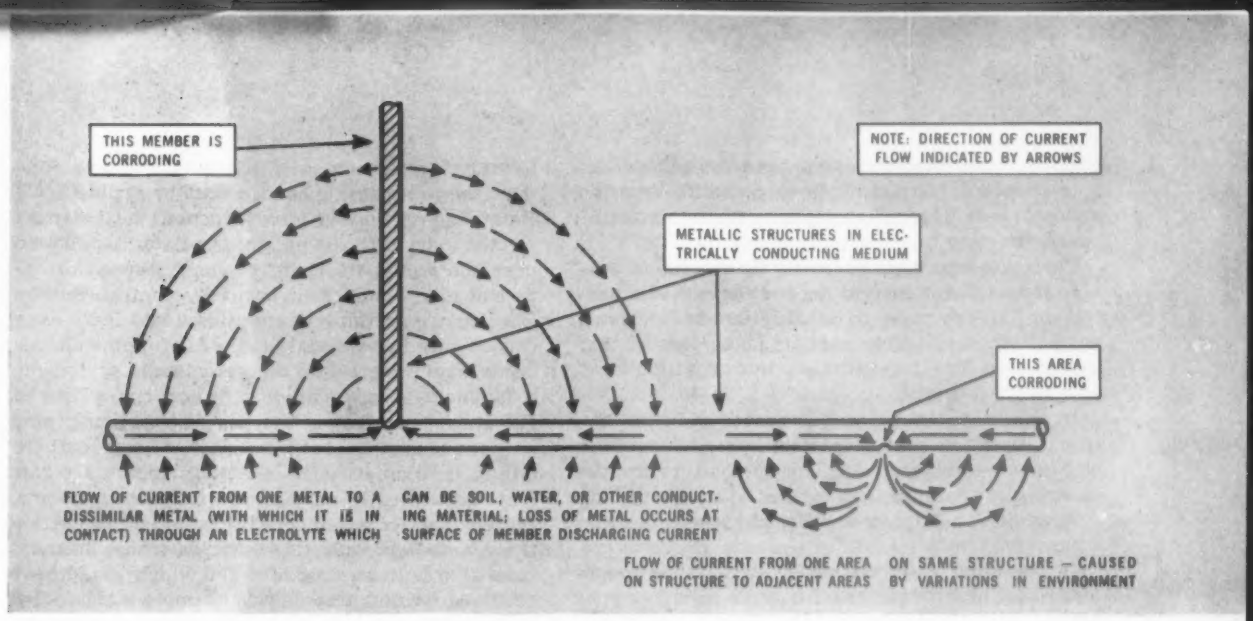
Basically, galvanic corrosion is caused by an electro-chemical reaction. This reaction is set up when a metal is embedded in a medium capable of transmitting an electric current, such as a liquid, or a moist soil (electrolyte).

During the electro-chemical reaction an extremely small electric current flows from one point of the metal through the medium to another point and then back through the metal to the first point to close the circuit. In so doing, the current continuously removes minute particles of metal from the point it leaves (anode) and deposits them in the electrolyte along its path to the other point (cathode). Thus the anodic area is gradually worn away while the cathodic area is undamaged.

What causes the flow of current? In simplest nontechnical terms, every metal we know of has a certain tendency to dissolve in water. The measure of this tendency is called "solution pressure." Gold has the least solution pressure, potassium the highest. In between these two are other familiar metals, such as (in descending order of solution pressure), magnesium, aluminum, manganese, zinc, cadmium, iron, cobalt, nickel, tin, lead, copper, silver, and platinum.

Under natural conditions any one metal in this series will generally react as an anode to those in the scale below it. The "electromotive" force (or voltage) between such metals increases with the difference in positions on the scale.

Now, whenever two dissimilar metals are put into electrical contact with each other, nature seeks to balance this voltage pressure difference by a flow of electrical current from the higher (negative) to the lower (positive) element. And always, the higher element deteriorates in the process.


THIS MEMBER IS CORRODING
NOTE: DIRECTION OF CURRENT FLOW INDICATED BY ARROWS
METALLIC STRUCTURES IN ELECTRICALLY CONDUCTING MEDIUM
THIS AREA CORRODING
FLOW OF CURRENT FROM ONE METAL TO A DISSIMILAR METAL (WITH WHICH IT IS IN CONTACT) THROUGH AN ELECTROLYTE WHICH CAN BE SOIL, WATER, OR OTHER CONDUCTING MATERIAL; LOSS OF METAL OCCURS AT SURFACE OF MEMBER DISCHARGING CURRENT
FLOW OF CURRENT FROM ONE AREA ON STRUCTURE TO ADJACENT AREAS ON SAME STRUCTURE — CAUSED BY VARIATIONS IN ENVIRONMENT

. . . YOU HAVE TO KNOW ABOUT GALVANIC CORROSION

GALVANIC CORROSION is costing industry millions of dollars. Sketch illustrates its destructive action on a buried pipeline. The amount of current and the paths it follows are determined by structural and ground conditions in each case.

Can Slow Down Corrosion

This deterioration is known as galvanic corrosion. The corrosion taking place in hot water tanks is a common example. The steel tank is zinc-coated, but the inlet and outlet connections are usually bare steel. Fittings are usually of brass, pipeline may be copper, and the drain plug of cast iron. This dissimilarity of metals is the ideal set-up for galvanic action—as every smart pipefitter knows, and tries to avoid.

The amount and speed of corrosion, as you can imagine, depend on the difference in potential (voltage pressure) between the dissimilar metals, and on the type of electrolyte in which they are both immersed. These dictate the amount of current flow, which determines the severity of corrosion.

You can see at the right of the figure (above) how this phenomenon of galvanic corrosion works in a pipeline. The diagram is intended to show the nature of galvanic current, not its flow. The amount of current and the paths it follows are determined by the structural and ground conditions of each case. In any event, where the circulating currents enter any metal from an electrically conducting environment, no corrosion will be found. But where the currents leave the structure, the metal will be consumed.

The figure shows how much corrosion can also occur at a point on the pipeline where the thesis of a dissimilar metal doesn't seem to hold. Actually, a pipeline of steel can in itself be dissimilar. For example, a new section of steel pipe inserted in an old section may have the same effect as a different metal. Also a small point on a pipe containing mill scale may create a local cell action. This is the way many pit holes occur. A burr or a scratch on a pipeline from a wrench can create a dissimilar surface, and encourage galvanic corrosion.

You can get the same effect of galvanic corrosion where only the electrolyte differs in constituency or moisture content. This happens in the case of deep well casings passing through different soils.

The presence of more or less oxygen (in air) in the dirt fill surrounding a buried pipeline also can set up local galvanic currents from the underside (where dirt is solid) to the top (where dirt is aerated) of the pipeline. As a result, the bottom side becomes badly corroded.

What Is Cathodic Protection?

If you can force a metallic structure to *collect* current at *every* point where it is submerged in an electrolytic medium, you stop galvanic corrosion. That's the key to cathodic protection.

In principle, cathodic protection is the provision of an "artificial" electrical current that opposes the natural galvanic current, and so nullifies its bad effects. It's sort of a fight-fire-with-fire scheme.

In practice, the imposed artificial current is kept

slightly higher than the galvanic current. The effect is to change the structure to be protected from an anode to a cathode. That explains the name "cathodic protection."

There are two ways currently being used to provide the artificial current needed for cathodic protection. In both cases an artificial anode is located away from the structure to be protected, so that current can flow *from* this anode *to* the structure, now the cathode.

In one case, the current is provided by an external direct-current generator, such as a rectifier or a motor-generator set. This method, called the electrolytic or impressed current method, usually uses carbon or graphite anodes, and sometimes iron scrap.

In the other case, the anode itself is composed of a metal high in the electromotive series, such as magnesium, aluminum, or zinc. This anode therefore produces a galvanic current that flows toward the cathodic structure. This is known as the galvanic method.

A commercial anode of magnesium has a useful "storage capacity" of 500-600 ampere-hours per pound. Compare this with the average auto battery of 120 ampere-hours; it shows how much energy is available in a galvanic anode.

The action of each of these methods is shown in the figure on pages 140-141. Note the reversal of the direction of electrical current from that in the diagram of galvanic corrosion. The current flows from the anodes through the conducting environment to the surface to be protected. It is then harmlessly drained *from* the structure through a permanently attached wire to complete the circuit. Of course, some of the protective current goes to noncorroding areas where it does no good.

Since the anodes are corroded in the galvanic method, they require periodic replacement. So you might say this method transfers the bad effects of corrosion from a valuable plant structure to an expendable substitute. And it concentrates those effects at a known point. Moreover, you don't need to lose any plant operating time for replacement of the structure. Nor do you waste a lot of maintenance time searching for possible damage. The anodes alone wear out. In fact, most cathodic protection installations can be designed to operate for a number of years before anodes must be replaced.

How Good Is Cathodic Protection?

Since cathodic protection prevents damage from galvanic corrosion, its benefits are not visible, and therefore not so easy to prove. Only special electrical testing apparatus will show you the forces that it combats.

Best measure of its efficacy is the experience with older known installations.

For example, back in 1932 the cost of repairing leaks in a natural gas transmission line in an extremely corrosive area in the South was so great that the company was considering replacing it. Before going to this huge expense, the company elected to try cathodic protection. After installation of rectifier units, the leak frequency dropped sharply and has remained at an easily controlled level since that time. Most of the subsequent leaks were caused only by eventual breakage of pipe walls already made paper-thin before cathodic protection.

In another case, cathodic protection by use of galvanic anodes saved the gas distribution piping in the congested business section of a large southern city. Corrosion leaks at a rapidly increasing rate were hastening the day of large-scale replacements. In the nine years since application of protection there have been only three new corrosion leaks, as compared with an estimated 600 which would have occurred for that period. This example is significant because the congestion and relative inaccessibility of the piping typifies the conditions encountered in many industrial plants.

What Are Its Limitations?

Cathodic protection is not a cure-all for corrosion of underground structures. It serves best when used with other protective measures.

You can cut down on galvanic corrosion by use of protective paints and coatings. Use of electrical insulating material around buried pipelines will disrupt galvanic currents. Use of electrically insulated joints where pipelines enter buildings will break closed electrical circuits. Often proper use of materials, or change in design, will eliminate or minimize galvanic corrosion.

Also, cathodic protection is not the primary means of controlling electrolytic corrosion of underground structures resulting from stray d-c electric currents of man-made origin. Examples are currents from street railway systems, plant power systems utilizing grounded d-c circuits, and mining operations using d-c equipment.

Cathodic protection can sometimes be used in such cases to advantage. But usually stray direct currents are made harmless by providing metallic bonds or paths between the areas on affected structures and the d-c power source causing the trouble. In fact, stray currents may even provide cathodic protection in those areas where they *enter* metallic structures from the soil or other conducting material.

Where In The Plant Is It Useful?

1. UNDERGROUND PIPING · Probably the most extensive application of cathodic protection at many industrial plants would be the protection of underground and underwater piping.

There is no limit to type, size, or usage of piping to be protected. It can be of steel, cast iron, gal-

vanized, copper, aluminum, or other pipe metals. It can range from the smallest to the largest in size. It can carry any product—steam, air, gas, water, fuel, or process materials.

Remember, however, that external cathodic protection will stop only corrosion of the outside of the pipe. Here, as in all other cases, it does not penetrate the structure being protected.

It is possible to protect the inner surfaces of a pipeline, provided it is large enough to install anodes axially inside the piping and at intervals throughout its length. Obviously the pipe would have to carry an electrically conducting liquid in order to make this technique work.

A good example of the scope of cathodic protection for industrial underground pipelines is the hydrogen plant of Wilson & Company at Oklahoma City. Constructed in 1945 without such protection, a large part of its 2200 feet of underground piping had already been replaced or patched five years later. In the first year after installation of a rectifier system with graphite anodes, only one corrosion leak took place.

This protection system solved several tough problems. Because most of the piping at the Wilson plant is buried either in or under concrete, repair operations were always costly. Also, they required a shutdown of continuous-process operations. But of even more serious import was the problem of leaks in the propane lines. This heavier-than-air gas could drift and form lethal, explosive accumulations in underground spaces or open tunnels of any kind.

The cathodic protection system used a totally immersed Class I, Group D, explosion-proof rectifier. All underground plant piping—water service lines, steam and air lines, natural gas lines, process lines, and conduit—were bonded together to make one complete electrical circuit. A single system protected the whole works.

2. LEAD CABLE · Cathodic protection of lead involves the same problems as when working with steel piping. But you must take care not to apply an excess of protective current.

Here's the reason. In cathodic protection the electro-chemical reaction involved in the flow of direct current onto a metallic structure creates an alkaline environment at the protected surfaces. The degree of alkalinity is usually negligible at the minimum current densities required for cathodic protection. But, if excessive currents are used, the environment may become strongly alkaline.

This alkalinity does no harm to steel or cast-iron piping, but it can damage lead and other metals referred to as being "amphoteric," such as aluminum and tin. The effect is called cathodic corrosion. Careful application and maintenance of a system will prevent it. The widespread use of cathodic protection on lead cable sheaths by telephone and electric power companies provides ample evidence of its value.

3. STORAGE TANKS · Cathodic protection can be used to protect both inner and outer submerged surfaces of storage tanks for water, oil, and process liquids.

Most common application is the prevention of corrosion on the inner surface of water storage tanks. In such applications, the protective current can be made to reach all under-water metal area if size and location of anodes are properly selected.

You may also be able to use cathodic protection to advantage inside brine or process tanks that contain electrically conductive liquids. Design and economic feasibility depend on several factors: (1) concentration of the liquid, (2) its acidity or alkalinity, (3) what anodes the liquid will tolerate, and (4) interior tank construction. Where the tank has internal obstructions or process equipment, it takes careful design to get proper distribution of the protective current to all surfaces.

By the same token, you may be able to use cathodic protection to protect any metal process equipment submerged in a tank.

4. CONDENSERS AND HEAT EXCHANGERS · In this type of equipment, galvanic corrosion often occurs on the water side, particularly where salt water or other corrosive coolants are circulated through the equipment.

Cathodic protection can be used to protect the inside of the water boxes, including the tube sheets and the ends of tubes. The protective current will not ordinarily penetrate more than a few tube diameters into the open ends of the tubes. Galvanic anodes are commonly used in this application.

Where corrosive sea water is used for cooling purposes in large condensers, cathodic protection will reduce corrosion. For example, it will mitigate corrosion on the fixed and traveling screens at the cooling-water intake chamber. Sometimes you can use it to protect the insides of steel suction and discharge lines.

5. STRUCTURES · Water-side industrial plants often have severe corrosion problems with metallic structures in sea water or brackish water. Common examples are sheet steel piling, steel pier construction, and underwater piping.

Control of corrosion of such equipment above the water line is best obtained with protective coatings. But it's a different story below the water line, where damage can easily mount to a dangerous degree before you discover it. Here only cathodic protection, alone or in combination with protective coatings, will satisfactorily reduce the corrosion effects.

Many plants have trouble with corrosion of steel structure footings. This can be severe where the earth is contaminated with plant wastes or other organic sources. Cathodic protection will not only multiply the life of such footings but also avoid the heavy cost of repairs.

The new Fairless Works of U.S. Steel in Morrisville, Pa., is using cathodic protection extensively to protect its plant from underground corrosion. It

first made many tests of soil and water conditions and charted probable galvanic currents resulting from steel, lead, and copper materials. As a result, all underground lead and copper lines are being protected by a neoprene insulating jacket. Structural steel is being protected by magnesium galvanic anodes.

What Does Installation Involve?

Cathodic protection is effective only if sufficient protective current is imposed continuously to keep the *entire* surface of the structure cathodic. Satisfying this requirement is the chief problem in the design of every system.

Many factors are involved in designing a satisfactory installation for each case. This is particularly true in congested plant areas, where an improper design may reduce the corrosion in the intended section, yet actually increase the corrosion rate in an adjacent section if the protective current is not properly controlled or stray currents get on adjacent structures. It takes a trained corrosion engineer, equipped to make sound engineering tests, to prepare satisfactory designs and take the precautions needed to avoid possible damage. And it takes trained personnel to supervise crews in the special techniques of installation of all equipment, including anodes themselves.

The testing methods are very different from those normally used in checking plant electrical equipment. Special measuring apparatus of a highly sensitive nature is needed to detect and evaluate the characteristics of electrical corrosive currents and voltages.

Actually you are dealing with galvanic currents having potentials of a fraction of one volt, and current densities of only a few milliamperes. In mild soil, for example, you may achieve complete protection of a steel structure at an impressed current density of less than 1 milliampere per square foot of structure, and in sea water you may need a density of more than 10 milliamperes per square foot for steel. Values for different metals vary, running as high as 50 or more milliamperes.

It's important to design a system to provide just the right protection — not too little or too much. Too much protection, for one thing, wastes the anodes. It can peel off protective paints and wrappings. And in an impressed current system it also wastes electric power. Control of current density determines the rate of consumption of the anode. The corrosion engineer can calculate the specific life of anodes at given output currents, so that you can plan a definite time for their replacement.

How Much Maintenance?

Every cathodic protection system needs planned inspection and maintenance if it is to be fully effective. The aim is to keep it operating with no "off" time.

There's no way to see whether a cathodic protection system is continuing to do its job 100%. You have to make periodic routine electrical tests at key points to check protective potentials and make system adjustments as needed.

A good plan is to log the results of the periodic tests and have the corrosion engineer review the log at routine intervals. Thus he can detect any gradual changes in the condition of the system and call for adjustments or replacement of anodes as conditions may dictate.

What Does Cathodic Protection Cost?

It all depends on the size and type of installation needed. But certain generalizations do apply:

Cathodic protection of simple, uniform structures, such as pipelines in uncongested areas, is cheaper than the protection of complicated structures. The latter need careful design of the anode system to insure that protective current will reach all parts of all surfaces to be protected. This involves higher engineering costs as the major item, and increased material and installation costs.

Costs for cathodic protection of complex metallic structures need not be prohibitive, but you naturally always seek economic justification. You first determine what corrosion is costing you annually. This cost should include not only repair and maintenance costs but cost of equipment downtime, any waste of product or damage to other property, and advanced depreciation due to shorter life.

Then you calculate the annual fixed charges of a cathodic protection installation and the annual savings expected from reduced corrosion. You make your decision by balancing tangible costs against savings. But don't forget to throw into this balance such intangible benefits as increased operating reliability and greater operating safety.

WHICH SYSTEM? Are impressed current systems with their continuing cost for electric power more costly than galvanic anodes? Here again the case itself decides. Where the total amount of current needed for protection is high, the cost of a rectifier installation can be lower. Galvanic anodes will usually have a lower annual cost in applications where the amount of current required at one point is low.

The choice between the two current sources will depend on cost of electric power, relative costs of materials, and local installation costs.

By this time it must be apparent that cathodic protection is best used in conjunction with other methods of corrosion control (such as wise choice of materials and protective coatings) for a well-rounded corrosion mitigation program. Neither system is the answer to all corrosion problems.

The last word is one of caution. Design of a system is a job only for experts.

"File 'em and forget 'em? Not on your life," says Parker Appliance. It gets ...

14 Cost-Cutting Extras With Shop Layout Blueprints

By SCOTT A. ROGERS, Manager, Jet Division
Parker Appliance Company, Cleveland

ALMOST EVERY OPERATING DEPARTMENT at Parker Appliance has found a cost-cutting use for shop layout blueprints that we used to bury in our files. All that's needed is a big supply of blueprints, some colored pencils—and a little ingenuity. Here are 14 examples:

1 PROCESS FLOW CHART • We draw them in colored pencil right over shop layout blueprints. Helps us find better materials handling methods; bottleneck causes; improved aisle arrangements; ideas for better layout. No need to make a special drawing every time we want to analyze flow of materials.

2 ASSIGNMENT CHART • Shop layouts are used to establish assignment of men to machines and areas. Same chart, coded or colored, can be used for more than one shift.

3 SAFETY AND FIRE PREVENTION • Areas are easily blocked out in colored pencil for fire-fighting teams. Locations of fire-fighting and safety equipment are added to drawings that we post in the shop.

4 ALLOCATION OF WORK AREAS • When the sweeper force is short, or when special clean-up is needed, the service department foreman just marks a shop layout with the areas to be covered by each sweeper. No need to walk the area with the sweeper, or to depend on verbal instructions.

5 REFERENCE FOR MACHINE NUMBERS • Anyone in the plant organization can quickly find out the serial number of a machine from its geographical position on the floor. This simplifies procurement of parts; makes facilities records useful for maintenance; helps keep those records up to date.

6 GUIDE FOR VISITORS • By spreading out a shop layout, we can quickly direct visitors to any point in the plant. For our open house, the layout served as a road map.

7 PARTS STORAGE LOCATION • A foreman can use a layout to show a move man where to store semi-finished parts, raw forgings, and castings.

8 SCHEDULING MAINTENANCE • It's much easier when you have a picture of the plant in front of you. Helps keep preventive maintenance records straight, too. We also use the layouts to identify machines that bear special watching.

9 SELLING OUR SERVICES • When we want to convince our customers that our plant is qualified to make a certain product, a shop layout really helps. It indicates scope and orderly arrangement of facilities.

10 BASIS FOR RE-LAYOUT • An obvious use. But we think the pay-off has been unusual. We can whip out a blueprint and quickly mark it up with ideas for better layouts.

11 INVENTORY AREA RESPONSIBILITY • We mark up the layout to assign areas for supervisors, inventory takers, accounting checkers, and others. Easier than describing in words. And a lot more accurate.

12 GAGE CHANGE TIMETABLE • Layout blueprints are used to show which machines require gage exchange and at what frequency. For instance, an "X" in blue pencil over the machine means its gages should be exchanged twice a shift; in red, every 24 hours.

13 PLANT SERVICES LAYOUTS • Our plant engineer uses the floor plan to plot changes in major outlets for electricity, air, and steam.

14 JOB DISPATCHING AND SCHEDULING • We use layout blueprints to indicate up-to-date work assignments by job number. Gives us a quick picture of *what* is being done *where* at any moment.

TIPS TO GOOD HUMAN RELATIONS for factory executives

By CARROLL W. BOYCE • Industrial Relations Editor, FACTORY

BLOCK THAT CHUCK! It isn't often you'll find an item about power failures as a "Tip"—that's usually in Joe's Department. But we've been hearing too much lately about an unhappy "side effect" of power failures—even very brief ones. If any magnetic chucks are used in your plant, be sure your safety people are on the ball.

What happens is this: The instant power goes out, the magnetic chuck loses its holding power. But sheer momentum will keep a high-speed cutter moving fast for some time. Result: The "chucked" piece is cut loose, may be hurled across a room with damaging force. The way the stories come to us, magnetic chucks on high-speed grinders are particularly dangerous unless heavily shielded against just this kind of "throwing" action when the power goes out.

Along these same lines, the Dept. of Labor has rather an interesting little booklet, "Mr. Manager . . . Guard Your Investment in Manpower." It's pitched at the economics of building in guards rather than adding them later. For a free copy, write: Bureau of Labor Standards, Washington 25, D.C.

NEW "CLASSIC" DEFINITIONS? One of the discussion leaders at this year's Conference on Human Relations of the Silver Bay Association was Byron Cherry, management consultant of the General Electric Company.

He came up with a couple of definitions that might well be widely adopted—although one of them brought out some dissenting opinion:

1. Management's responsibility is to earn the maximum short-range and long-range profit and to provide the maximum service to customers, owners, employees, suppliers, and the whole public. Some in the discussion group argued that "and to provide" should be replaced with "by providing." Either way, it seems to us, it will take a lot of doing to come up with a better definition of management responsibility.

2. True leaders are men who can both lead their organization and follow the lead of their people. And it probably won't surprise you to learn that the discussion group agreed that selecting and developing men who can fill that specification is management's No. 1 problem.

GUIDED TOUR IN PRINT Not exactly a new idea, but certainly a bit off the beaten path as the theme of a "welcome" handbook for new employees. Denison Engineering Co., Columbus, Ohio, has used this inviting twist in a handsomely illustrated booklet prepared for its newcomers.

The host on this guided tour is W. C. Denison, company president. Without overdoing it, his picture is used every few pages—whenever a new subject is introduced. Key to this successful

handling is that he's pointing to a sales chart, some new equipment, or whatever's appropriate at that point. The text, incidentally, is all done in a conversational first-person style.

SAFETY SHOES ON WHEELS Many companies consider it a first-rate nuisance to sell safety shoes to workers. But they recognize that workers are far more likely to buy—and wear—them if they are easily available.

If you are one of this group, maybe you could find a local merchant or some ex-GI's looking for a good business and get them to copy this "safety shoes on wheels" idea from Cincinnati. There, three brothers have been doing a land-office business for more than five years.

Secret of the success: A really complete line of safety shoes carried from plant to plant in truck-trailers. Each of the 175 plants on the "route" is visited from a couple of times a year for the smallest to twice a month for the largest (12,000 employees).

Here's a hint on prospective volume: The Cincinnati outfit sells an average of one pair of safety shoes per year for each 19 total employees in the plants served.

HELP FOR MEN ABOUT TO RETIRE Getting a worker mentally adjusted to the prospect of retirement is never an easy job. To some men it's like being hit with a wet towel. To others an over-rosy picture of life-on-a-pension can make retirement an unhappy letdown.

Between these extremes is a top-notch job done by Wisconsin Public Service Corporation. In its employee magazine *Contact* is an article "Dan Leach Up for Retirement Soon." Tells in pictures and words exactly what plans a really typical employee (Dan's a PSC bus driver) has made for his retirement. Because it's a case study, there's nothing "preachy" about the job, but the "message" is all there.

INSPECTION BY SPOT CHECKS IMPROVES QUALITY There are lots of things wrong with 100% inspection, including the fact that it doesn't catch 100% of the mistakes and it costs plenty. But perhaps its worst feature is that it encourages employees to "take chances" on quality; they figure the inspector will catch it.

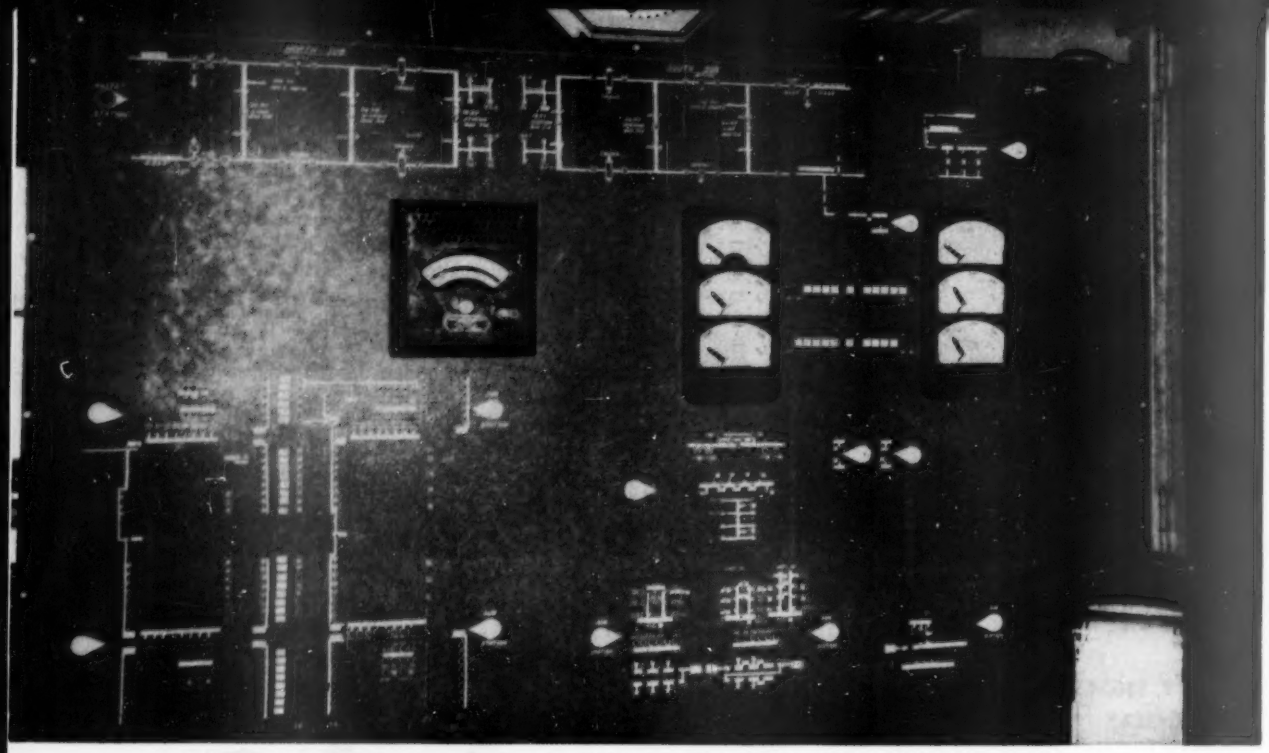
Starting three years ago, Lockheed threw out 100% inspection on its plane assembly, put responsibility back on the workers, subject to unannounced spot checks. This saved materials, reduced delays, and worked so well the Air Force and Navy accepted the idea for their planes at Lockheed.

Now the spot check technique is to be extended to all manufacturing departments that have earned—and continue to merit—a "Certificate of Quality." The certificates go only to on-schedule departments with a low rework record.

HOT WEATHER SUGGESTION In October? Sure, while you still have fresh memories of a torrid summer—at least in most of the country.

If your office people (and perhaps yourself) swelter through a summer "maintaining appearances" in ties and long sleeves, or even coats, you might take a hint next year from the Post Office Department in New York. Executive Order H-587 instructs "outside" employees to "remove the necktie and open the shirt collar at the collar button . . . when the temperature reaches 80." The "inside" employees were directed to wear short-sleeved shirts without neckties "until Labor Day." So you see, casual wear is now "official procedure."

In case you need an example to bolster up your courage for a really radical move, the August heat wave in New York brought the unusual sight of an executive walking into his Fifth Avenue office wearing Bermuda walking shorts. To some raised eyebrows, he is reported to have snapped, "If the Governor-General of Bermuda can wear them to his office, I guess I can wear them to mine!"



DISPATCH BOARD GIVES "BIG PICTURE" OF POWER SYSTEM, SHOWS HOW SINGLE CHANGES AFFECT ENTIRE PLANT

How to Protect Your Power Distribution

BY J. W. ST. ANDRE
Electrical Editor, FACTORY

It's been a tough day. You stretch, yawn, and head for bed and a sound night's sleep. Can you be sure you won't be awakened by someone calling from the plant to tell you a power failure has things in an uproar?

You can rest easy if you have a reliable power distribution system—and if it's properly operated and maintained. Otherwise you may be disturbed.

A lot of troubles from power distribution? No. But when they come they're whoppers.

Two ways to avoid the whoppers are outlined in this article. Not the only two, of course. For that matter, you may have some of your own. If so, let's hear from you.

1. Install a power dispatch board

Power's gone haywire in Department X, holding up a rush job. Production manager's pressing for fast action. But it must be the right action. The wrong action—throwing in the wrong circuit breaker, for instance—could knock out your whole electric power system.

Rush or no rush, your electrical supervisor can't make a hit-or-miss decision. He needs the facts—an over-all picture of the power set-up—before he acts.

He knows he's on the spot.

Best tool to get him off is a power dispatch board (see photo above).

Why? Because the board spreads the entire system out in front of him, tells him at a glance how even the smallest change will affect the whole plant.

A dispatch board (like the one in the photo) is a power system road map. It shows *where* power goes and *how much* goes *where*.

Symbols represent different switches and circuit breakers. Colored pegs, inserted in holes in the symbols, tell whether a device is closed, open, tagged out for construction, or out of order. Meters show loads on feeders. A voltmeter in the center of the board indicates incoming voltage. A curve-drawing meter (lower right in photo) records the voltage on a chart.

What you do at one substation may affect other substations. That's why it's wise to do all switching from a dispatch board. Then, if you have to remove a piece of equipment for maintenance, you can plan to tie in certain feeders. And you don't risk shutting down a department or two by throwing the wrong switch.

Does a dispatch board carry a high price tag? By no means. And it'll save you plenty of troubles.

SAFETY TAG: FOR LOCKING OUT CIRCUITS AT WRIGHT AERONAUTICAL PLANT

2. Set up a safety tagging system

You're asking for injuries when you remove electrical equipment from service without tagging it out. That goes double for the devices in your distribution system. Controls of individual equipment are in sight or near the equipment. But things aren't so simple in a distribution system. For instance, a circuit breaker may be a half-mile from the switchboard it feeds.

Who's responsible for a safety tagging system? The top men in your electrical department. It's their baby—to develop and enforce. If they do the job right, the system will:

- Protect your employees.
- Protect your equipment.
- Designate abnormal working conditions.

Where do you start in setting up the system? First off, it's a good idea to consult your local power company. Sure, their system is probably too elaborate for use in an industrial plant. But chances are it'll give you some helpful ideas. You can also pick up good tips from the large plants in your area, especially the big power users.

POWER COMPANY • West Pennsylvania Power Company has had an effective tagging system for 25 years. Its basic points:

1. It applies throughout the company.
2. It applies to both electrical and mechanical departments, is broad enough to cover all possible conditions.
3. It's easily understood by mechanical and electrical men.
4. It's strictly enforced.
5. It authorizes only a limited number of people to issue tagging instructions.
6. All equipment is considered "alive" unless tagged otherwise.
7. Rules are printed. (It's felt that verbal instructions carry no weight.)
8. If a rule can't be applied to a practice, the rule or the practice is changed.
9. Records are kept on all tags used.

INDUSTRIAL PLANT • The Wright Aeronautical Division of Curtiss-Wright Corporation, Wood Ridge, N. J., has had a tagging system since the plant was built in 1942. Three white 3x6-in. shipping-style tags are used — two for locking out circuits (see picture at left), the other as a caution tag. Lettering is red for circuits over 480 volts; blue for 480-volt, 120-volt, and d-c circuits; black for the caution tag.

Here's how the system works:

When a foreman wants to tag out a line to do repair work, he notifies the electrical supervisor. The supervisor orders out the circuit. This order goes to the load dispatcher, who fills out a tag, opens the switch, and tags out the circuit.

When the circuit is ready to be energized, the electrical supervisor orders the switch closed. The load dispatcher then closes the switch, fills out the rest of the tag, and returns it to the electrical department office.

The caution tag is used for special operating instructions. For example: A tie-line circuit breaker is closed to feed another substation during repairs. So the tag on the breaker reads, "Do not open this circuit breaker. It is feeding Substation No. 2 temporary power."

DON'T LET 'EM ALL IN THE ACT • So now you've got a dispatch board that's guiding you out of troubles and a tagging system that's gospel to your men.

Can you count on that undisturbed night's sleep? You can—if you stick to one rule. It's this:

Don't let everybody in your electrical department monkey with your distribution system.

The more men involved in switching, the greater the risk of wrong moves. So hand the maintenance and operating job to one or two selected men.

Who does what? It's easy to set up boundaries. Your distribution system starts where the power passes through the metering equipment, ends where the power is used. To your ordinary electricians, everything inside those limits is "off limits."

Paced-piece maker helps . . .

Trainees Reach Standard Sooner

Here's a modern variation of the old metronome. It gets operators over the critical period while learning to increase their speed. Company says it gets results. And the operators love it.

By FRANKLIN L. HERTIG • Industrial Engineer
Tung-Sol Electric Inc., Weatherly, Pa.

How much does it cost to train your operators? Perhaps you already know. If not, try to figure it out. Take into account your instructors' time, supervisors' time, tie-ups in production equipment, spoiled work, and high turnover in trainees.

No self-respecting trainee relishes the thought that she is not earning her way. In addition to this, slow progress and discouragement become powerful inducements to an operator who hears of better opportunities elsewhere. Undoubtedly much of the high turnover in trainees can be traced to these reasons.

The task then of helping such employees is a field where much work can be done. The benefits are of a type that contribute to the welfare of many people, as well as to that of the company.

"How fast should I work?"

When we talk about training after an operator learns the job, we are, in most cases, talking of pace. Unless the job is non-repetitive, the largest portion of the problem has to do with a new operator's ability to acquire speed. On repetitive jobs not governed by machine speeds, the question is always asked, "How fast am I expected to work?"

When a new operator has been on a job for a couple of weeks, she may be producing 80 or 90 pieces an hour on a standard of, say, 200. At this time the standard of 200 an hour seems almost impossible. This is the time when new operators need help and encouragement—and, unless they get it, there is a good chance they may become discouraged and quit.

On the other hand, an operator who is helped through this difficult period can easily become one of the most reliable of employees.

The paced-piece maker sets the pace

In our own organization the newest and most promising training aid is a timing device we have named the paced-piece maker. It was worked out in collaboration with Charles F. Miller of our equipment division.

The paced-piece maker is designed to help operators increase their pace and earnings. When they use it, every piece they work on offers an individual challenge to their ability. And the degree of effort can be predetermined.

About 65% of the factory jobs in our plant are on a straight piecework basis. As is customary, new piecework operators are paid a minimum guaranteed rate until the value of their production exceeds the support level. Anything produced above this is paid for at a rate per thousand pieces. Most of the other production jobs are of a varying nature and do not lend themselves easily to incentive pay.

We realize, of course, that "piecework pay" is no magic cure-all for high production. Operators must be trained, their quality controlled, and their morale kept at as high a point as possible so that they, and the company, can profit.

In working with new operators we have found that, after an enthusiastic beginning, most of them will taper off at a low level unless their interest is kept high. One of the best ways of doing this, we found, is to offer them new challenges.

How the paced-piece maker works

The paced-piece maker contributes to the solution of this problem. A supervisor notices that one of his new operators has reached a low point of production and does not seem able to go beyond it. He investigates and finds that the operator knows the work and the proper method of doing it but has no speed.

The supervisor next assures himself that the operator wants to earn more money. She feels, however, that the standard of 200 pieces an hour is beyond her reach and that, say, 90 an hour is all she can do. The supervisor then suggests that he knows a way to help her reach the standard quickly, if she really wants to make the effort. If she is willing, he introduces the paced-piece maker. He explains that the machine will be set to indicate the time it should take her to finish a piece so as to produce *a little more than she is presently doing*. When the time interval allowed per piece is up, a red light will go on. The object, he tells her, is to finish each piece before the light goes on, and to shorten the interval as her speed increases.

First, he times her for a few pieces with a stopwatch and arrives at an average time per piece. Then he sets the stationary indicator at an interval about 10% less. As each new piece is picked up, he tells her to press the pedal. This resets the time indicator and counts the piece at the same time. At the end of each hour the operator records the amount on the dial and resets the counter.

The supervisor watches the operator go through the cycle a few times to be sure everything is understood. At the end of an hour he checks results and encourages her.

How it helps the operator

Invariably we have found an immediate increase in production. (We have had increases ranging from 15% to 40% in 3 hours.) However, it must be remembered that a large increase in production is also a great strain on an operator who is not used to it. In some cases, it may be necessary to adjust the interval to a shorter time, if the operator is finishing 'way ahead of time. With other operators, it will be better to use it only a few hours for the first couple of days. An operator should not get the impression that making a standard is going to require a great deal more effort than she puts out when achieving 75% of standard. It must be explained that the work will become much easier once she gets used to the pace.

One problem is that operators become attached to these helpers. Comments like this are frequently heard: "If you take it away, I won't be able to make my production." This rarely happens, however, once the standard has been achieved. Sometimes we compromise with an operator by giving her a small lever counter to use instead.

Although the paced-piece maker has many applications, its greatest benefit is realized when helping trainees increase their earnings. We have often brought 70% operators up to 100% and better.

When using this device, we have found it important to follow the progress of the operator closely and encourage her often. Each day the time interval should be reviewed with the objective of reducing it whenever practicable. At these times, the supervisor praises the new achievement.

Five additional benefits

There are additional advantages to this device:

- It permits a supervisor to detect trouble from a distance. If the red light is on a long time, it may indicate the operator is having trouble. (New operators sometimes hesitate to call for help.)
- The counter gives a complete record of production so that an operator knows how well she is doing at all times.
- It provides an objective approach to the problem of bringing an operator up to standard and increased earnings.
- Very often it uncovers delays which were not noticeable before, but become very apparent when the red light indicates how much time they take.
- It frequently pays for itself within 30 days.

Three specific examples

- We manufacture miniature radio tubes. Parts are assembled and welded together by means of small spot welders. Many of these parts are small and fragile and need care in handling.

Tube mounts are assembled by units of one to seven operators, depending on the number and variety of elements. In a group of seven girls, one poor operator can hold up the production of the entire unit.

I recall one group where six of seven operators had demonstrated their ability to produce at standard. The unit was making between 80 and 85%. Investigation revealed that the fourth girl was the weak spot. The paced-piece maker was brought in. In a few days the girl built up her speed and the unit was making 100% like clockwork. The machine was taken out in less than a week.

- One foreman, with multiple units, likes to use it where operators work sporadically. One operator will pile up the next girl with work, then slow down until others have to wait, with consequent production loss. The device soon corrects this.
- A unit of six girls had been averaging 174 pieces an hour on a standard of 206, which they said was too high. The paced-piece maker was introduced into the unit at 12:40 p.m. The production for the next full hour was 203. Before the afternoon was over they had reached 213 an hour and there was talk of trying for 250. Other units then began clamoring for paced-piece makers.

"Is the paced-piece maker safe?"

The question of safety was considered carefully during the development of the paced-piece maker. We never had even a minor accident that could be traced to its use.

It must be remembered that *the time interval is predetermined by each operator's performance*. As a piece of work is being completed, the operator *expects* the light to go on. The machine is generally placed in the line of sight and it is quite easy for the operator to note the location of the indicator as it moves to the zero position.

The Reader AUDITED PAID ABC CIRCULATION *His Mark*

THE ABC that appears in the symbol at the top of this page stands for Audit Bureau of Circulations. The symbol itself is an emblem of cooperation, in which every subscriber to this magazine has an interest.

The Audit Bureau of Circulations is a voluntary, non-profit, cooperative association. It was founded in 1914 and now consists of 3450 advertisers, advertising agencies and publishers in the United States and Canada. This magazine is proud to be a member.

ABC originally was set up to help take the racket out of publishing, to eliminate the waste and guesswork then so prevalent in publishing and advertising, to establish order and confidence in place of the misunderstanding and misrepresentation that arose from unverified circulation claims and dubious circulation practices. Its mission was to protect the interests of both readers and advertisers.

THIS IT DID by first defining the term "paid circulation." Then it established standards and rules to govern subscription sales practices and records. Finally it set up an auditing organization to verify the claims and report the facts concerning the circulation of each member publication. It now maintains on that job a working staff of sixty-five full-time auditors. So the ABC symbol has become the hallmark of circulation standards and advertising values. Each member publication must maintain those standards if it wishes to retain its membership and display the ABC symbol.

This ABC audit is no perfunctory affair. When a business publication, such as this one, becomes a member of the Bureau, it agrees that the auditors shall have "the right of access to all books and records." Their inspection, therefore, may cover any part of its operations. Original subscription orders, payments from subscribers, paper purchases, postal receipts, arrears of payments, and many more items are painstakingly checked by the auditors. In many instances they go behind the records to seek verification from subscribers themselves as to the terms of their subscriptions.

IN DOING ITS JOB, ABC has created many values for both publishers and readers as well as for advertisers. That is because the publication that becomes a member of ABC thereby offers the strongest possible guarantee of its primary devotion to the interests of its readers. The function of a business magazine is to be useful to its readers. When this service is rendered by an ABC publication, it is constantly subject to the practical test of reader acceptance and approval. As each subscriber has the right to purchase or refrain from purchasing an ABC publication, that collective right confers upon the readers the power to say whether or not the publication will survive. Thus the report on its ABC audit provides the most direct assurance that a publication stays in business only because of a voluntary demand by readers who find its editorial service responsive to their needs.

Naturally, the editor of each business publication follows closely the score thus racked up by his paper in its ABC reports. In the scope and tone of his editorial coverage and treatment, in the selection and presentation of his editorial content, he must constantly labor to maintain and enhance the readers' acceptance of his efforts. That is why the editorial standards established by ABC publications set the editorial standards for all publishing. That is how the ABC constantly stimulates its member publications to become even more useful to their readers.

AND THAT IS WHY the ABC symbol has become the Mark of the Reader, a constant reminder that his willingness to pay for an ABC publication is the acid test of its value both to him and to its advertisers.

McGraw-Hill Publishing Company

FACTORY MANAGEMENT AND MAINTENANCE

330 West 42nd Street, New York 36, N.Y.

OFFICE OF THE EDITOR

Memo to Readers:

Don't stop. Keep going. Else you'll miss a lot more profitable ideas in articles and departments still to come . . .

Nobody loves a fat man -- or the maintenance department. One way for the latter to increase its popularity is cited in Maintenance Pointers, p. 154.

Need any idlers? Conveyor idlers, that is. It's one of 47 catalogs you can get free. Check coupon on p. 158.

Slickest shelter we've seen for outdoor storage is Yard-Stor, in What's New in Equipment, beginning on p. 168.

Can pickets cuss? Not on the picket line, if a recent Court-of-Appeals' decision sticks. Details in Practical Labor Relations, p. 252.

So they took the $300,000 and added it to net profits. Proof that "It Pays to Look at Your Scrap Pile," p. 268.

No more scraping and painting hot water tanks -- if you use a new lining described in Plant Engineering Problems, p. 284.

Store a conveyor on overhead racks? Sure, if it's the aluminum kind referred to in item 45 in Plant Operating Problems, p. 288.

Put that college grad to work in production control. Best place in the plant for him to get the over-all picture that'll fit him into some supervisory job. Turn to p. 20[illegible]

Famous last words (if you have a union): "If a guy's work is lousy, fire the bum!" But what to do about sleepers, insubordination, loafing? See p. 308.

Signs all point to 1954 as the biggest plant modernization year of all time. For a 10-step blueprint, try p. 316.

Pliotuf is probably all its name implies. It's what the maker's calling two new resins. New Materials, p. 322.

By CARL G. WYDER • Maintenance Editor, FACTORY

Prefabricated curb serves as . . .

. . . Good Bumper to Protect Sidewalls From Truck Damage

When Frigidaire recently built its new plant in Dayton, it also aimed to cut maintenance costs.

FACTORY described some of the many money-saving innovations in its May "Better Plants" issue. Here's another one — a prefabricated concrete curb to safeguard partitions bordering the aisleways used for truck traffic.

It's a rare plant where truck traffic doesn't ram into a sidewall, railing, office partition, or stairway at least once a month. I've seen smashups occur within an hour after repair of previous wallop.

This simple bumper is solving that headache for Frigidaire. It was fabricated in 10-ft. sections, with ½-in. steel reinforcing rods extending the length of each section at each of the four corners. Width of cross-section at the base is 11 inches, and tapers in along the front edge to an 8-in. width at the top. This taper begins after a 3-in. vertical rise. Over-all height is 8½ inches. Vertical holes located 2½ feet from each end of a section hold steel rods that are driven into the floor to keep the bumper in position.

Total cost of the bumpers was $1 per lineal foot, divided into 90¢ material cost and 10¢ for installation. Frigidaire had the bumpers made to order by a concrete products manufacturer in Dayton. This was cheaper than making them itself, because the supplier already had forms that needed only slight modifications to meet the specifications.

Start a Procedures Manual for Maintenance and Repair

Not a brand-new idea. FACTORY has suggested it for several years. But every so often we meet somebody who thinks we ought to push it more.

This time it's Fred DeLong, one of Exide's mechanical engineers. Says Fred:

"I think industry can make far better use of an M & R procedures manual than it's doing. My Armed Services experience showed me how valuable it can be in getting repairs done right, but fast.

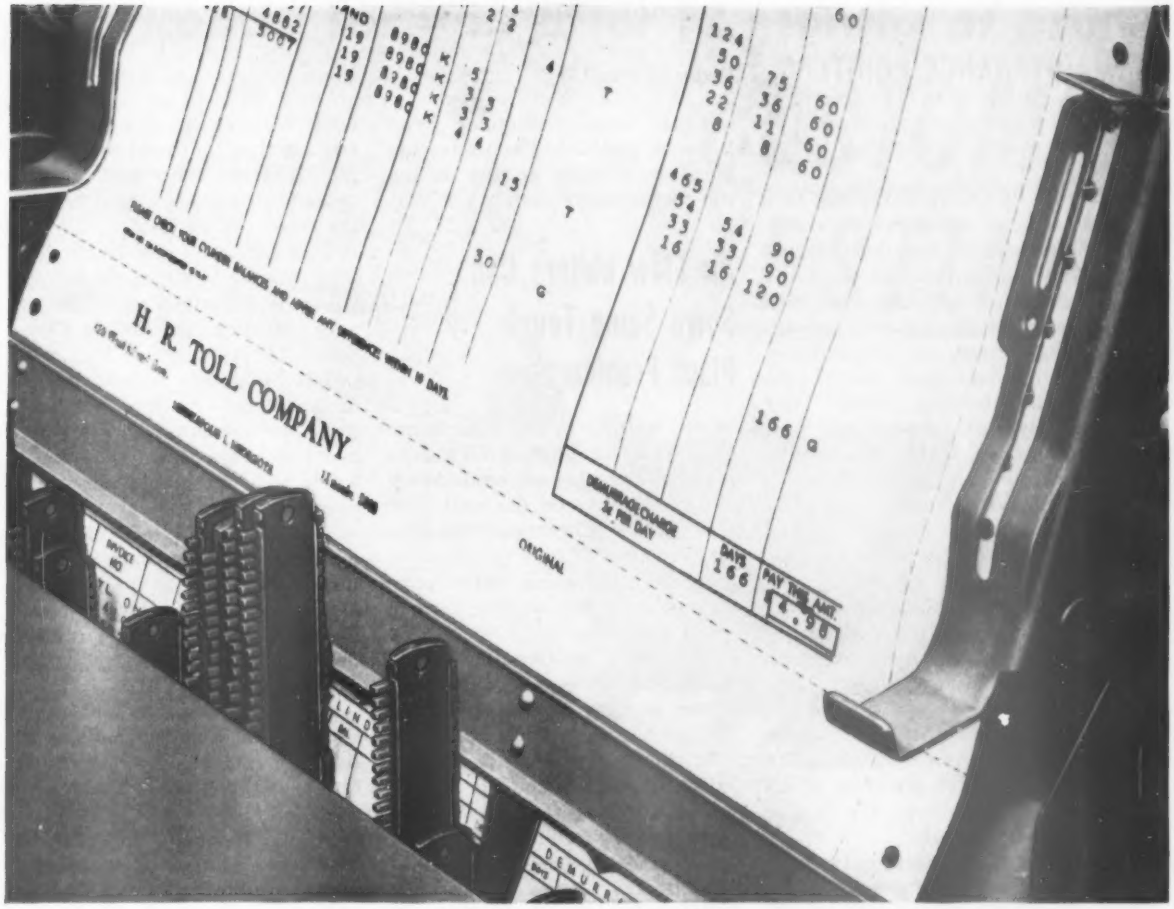
"Sure, standardization and unitization of equipment are part of the answer to cutting repair costs. But when something goes haywire you're still dependent on human skills. Without a manual you're at the mercy of the craftsman, who can goldbrick on the job even under good supervision.

"For orderly trouble-shooting you can't beat a manual. And a manual in flow chart form, showing step-by-step diagnosis, will make the job easier to follow.

"You can develop your manual as a training guide. Then you can place separate instruction sheets under transparent covers for use on the job. I'm really surprised more people aren't quick to adopt this money-saving technique."

Nobody Loves the Maintenance Department

FACTORY's roving editors hear this dirge in various keys and tunes. Maintenance superintendents even tell us they have sensed the dislike and distrust of



This IDEA from Remington Rand...
got rid of overtime for H. R. Toll

Here's how vital reports — printed at 6,000 lines per hour — cut bookkeeping work to a minimum and eliminate overtime for a Minneapolis distributor.

The H. R. Toll Company reports such benefits from its Remington Rand punched-card installation as: on-time statements including complicated container demurrage calculations . . . automatic accounts receivable aging for faster, easier collections . . . and inventory control by actual item turnover without guesswork. They also get such time-saving management facts as: fast, detailed sales analysis by product, salesman, territory . . . up-to-date facts on gross and net profits . . . complete data for making decisions on pricing policies . . . and automatic scheduling of overall operations.

This profit-building idea shows clearly why your Remington Rand representative is so well equipped to do the best job for you. After he gets all the facts about your problem, he is free to recommend the one method which will best suit your needs: manual, visible, photographic, machine, punched-card, electronic, or any combination of these methods. He can also offer you any business service required for the efficient installation and operation of your system. Feel free to call him on any kind of management problem.

ALPHABETICAL TABULATOR

AUTOMATIC PUNCH

ELECTRONIC SORTER

GOOD EXAMPLE FOR SMALL FIRMS

Certified Report #876 proves once again that small firms, as well as large, can profit by punched-card methods. This report shows in detail how the H. R. Toll Co. cut costs and eliminated overtime with Remington Rand punched-card methods. For your free copy, call Remington Rand in your city or write to Management Controls Reference Library, Room 1268, 315 Fourth Ave., New York 10, N. Y.

Remington Rand INC.

PROFIT-BUILDING IDEAS FOR BUSINESS

other departments so long and so often they've got callouses all over.

But why this disharmony? One maintenance executive says:

"It's because the departments served by maintenance don't appreciate how important it is to their operations. All they see are the bad effects on production—downtime for repairs, loss of output, interference with their efficiency. But," he went on, "now we're getting smart. We're promoting our achievements!

"Other departments have always heard all about the bad things we do, the trouble we cause them. Now we're reminding them about the good things we're doing—the things they forget so quickly. We issue a periodic report to all department heads. It tells them of some nice things done since the last report. And what goals we have in view for them. We show a tentative schedule of all our projects. And we try to give everybody a break.

"When each department sees itself in the whole scheme of things, it gets a better perspective of our strength and limitations. You know, in our plant the production guys are actually getting to like the maintenance men."

Air Flow Meters Can Solve Some Tough Plant Problems

While waiting in the gate house of a chemical plant in New Jersey the other day we noticed two wind indicators on the wall. One was marked "Direction," the other "Velocity."

Upon questioning their purpose, we got this answer from a plant guard:

"I keep a written log of the wind readings every 15 minutes. Often we are accused by town officials of polluting the air. (*Ed. Note*: The town is about 3 miles distant.) Although we are one of the largest plants in this vicinity, we guard against air pollution. Usually some other plant is to blame.

"How do we prove we are innocent? We probably can show from our log that the wind was blowing another way, and with a velocity that made a drift toward the town impossible."

This gave us a yen to dig further into the value of an air meter in an industrial plant. So we asked Hastings Instrument Company, Inc., Hampton, Va., why people in plants bought its air flow meters — the engineer calls them anemometers. The Hastings people told us dozens of reasons, a few of which may solve one of your problems. They are used . . .

. . . **in plant stacks to help maintain proper furnace combustion** and thus avoid air pollution.

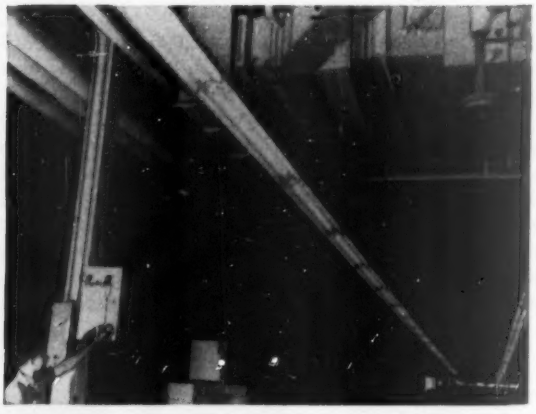
. . . **to take velocity measurements in heating and cooling ducts,** drying tunnels, chemical exhaust hoods.

. . . **for checking flow of air** in room areas. Cool air moving 50 feet per minute is ample cause for a worker to complain of a draft.

. . . **for balancing heating and ventilating systems.** Relocation of plant equipment often requires adjustment in air flow.

One of these may solve your maintenance problem

ACID BATHS in these 50-ft. metal processing tanks at Lockheed Aircraft Corporation, Burbank, Calif., prepare aluminum and alloy parts for painting. Two tanks are lined with Koroseal (made by The B. F. Goodrich Company) to resist solutions of nitric and phosphoric acid and Iridite No. 14 solution at moderate temperatures. Tanks are 4 feet wide, 11 feet deep.



REGULAR CLEANING of the dust collector plates of the Trion electrostatic air cleaner in the overhead air cooling units was insured at Mennen Company's plant near Morristown, N. J., by putting all service controls at floor level. Men don't have to climb 20 feet to manipulate switches for fan and electrostatic unit. Wash water valve also is operated by remote control.

Ready for you after 12 months of brutal

CUSTOMER TESTING!

CLARK's New and Exclusive HYDRATORK DRIVE*

Here's how it improves your fork-truck operation:

1 **MORE WORK:** faster get-away, positive power without slippage; moves heavy loads and climbs ramps with ease.

2 **LOWER COST:** higher percentage of "on-the-job" time results from no clutch problems, "cushioning" effect on motor and drive members.

3 **GREATER SAFETY:** hydraulic brake system, linked to torque converter, automatically cuts power; engine cannot be started unless controls are in neutral.

4 **IMPROVES DRIVER EFFICIENCY:** finger-tip direction control and elimination of gear-shifting conserves operator energy.

* *Now available in 6-7000 lb. capacity truck*

Not one, but *eighteen* HYDRATORK-equipped trucks were placed in customers' plants for a full year of on-the-job testing. Without exception, these units proved that reduction in driver fatigue and of truck downtime results in greater production from HYDRATORK-equipped trucks.

1903 1953 CLARK EQUIPMENT

Mail the coupon for detailed literature which explains how CLARK's new and exclusive HYDRATORK DRIVE operates.

CLARK ELECTRIC, GAS, DIESEL, L.P. GAS
FORK TRUCKS
AND POWERED HAND TRUCKS . INDUSTRIAL TOWING TRACTORS

INDUSTRIAL TRUCK DIVISION • CLARK EQUIPMENT COMPANY • BATTLE CREEK 12, MICHIGAN

Please send: ☐ Hydratork literature ☐ Condensed catalog
☐ Have representative call

Name _____

Firm Name _____

Street _____

City _____ Zone _____ State _____

AUTHORIZED CLARK INDUSTRIAL TRUCK PARTS AND SERVICE STATIONS IN STRATEGIC LOCATIONS

Need help with your problems?

IMPORTANT NEW Free CATALOGS

. . . they're the cream of this month's crop . . .They describe latest methods and equipment. Tell us which ones you want. Use the handy coupon at the bottom of the page. If somebody beat you to it, there's another on page 282.

MECHANICAL EQUIPMENT

1 Conveyor Idlers
Light, medium, and heavy-duty 20-degree troughing idlers are among more than 500 pictured and described in book 2416. You'll find schematics and dimensional data for each. Specifications and application data help you select. 48 pages. Link-Belt Co.

2 Sprockets and Chains
Bulletin A-624 gives you 24 pages of helpful data on selecting roller chains and sprockets. Cross-section drawings, dimensions, and specs. Includes section on chain drives. Tips on installation and maintenance. Dodge Mfg. Corp.

3 Roller Chains
This 16-page catalog features maker's stock roller chains and sprockets. Selection information and tips on how to install and remove. Tables cover speed ratios and technical data. No. 753. Diamond Chain Co.

4 Belting
"Belting Technical Data" is the title of this 48-pager. It covers transmission, conveyor, and elevator beltings. Includes general and engineering data on three types handled in question-and-answer style. Diagrams and charts help you select the proper size and quality. Boston Woven Hose & Rubber Co.

5 Gas Turbines
24-page booklet covers a line of gas turbine power plants. There are load diagrams, dimensional outline drawings, and performance curves for each type. Lists twelve factors to be considered in selecting for mechanical drive service. Includes design and structural features. B-5859. Westinghouse Electric Corp.

6 Pumps
Process pumps for handling corrosive and abrasive liquors in a wide capacity range from 20 to 1300 gpm. are described in this 8-page bulletin. Illustrations show ready accessibility of parts. Dimension tables and range diagram. No. 52B6615C. Allis-Chalmers Mfg. Co.

7 Cone-Drive Gears
Bulletin CD-173 gives you 93 applications of cone-drive gears, with standard center distances from 2 in. to 18 in. providing horsepower ratings up to 800 hp. Many illustrations. Ratio data and specs. 36 pages. Cone-Drive Gears.

DUPLICATE COUPON ON PAGE 282

MAIL THIS COUPON FOR FREE CATALOGS *(Good until Dec. 31, 1953)*

FACTORY MANAGEMENT & MAINTENANCE (October 1953)
330 W. 42nd St., New York 36

I'm circling the numbers of the catalogs and bulletins I want:

1	2	3	4	5	6	7	8	9	10	11	12	13
14	15	16	17	18	19	20	21	22	23	24	25	26
27	28	29	30	31	32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47					

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OTHER CATALOGS

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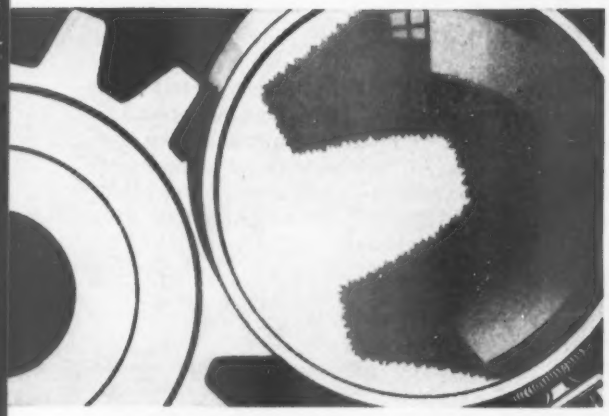
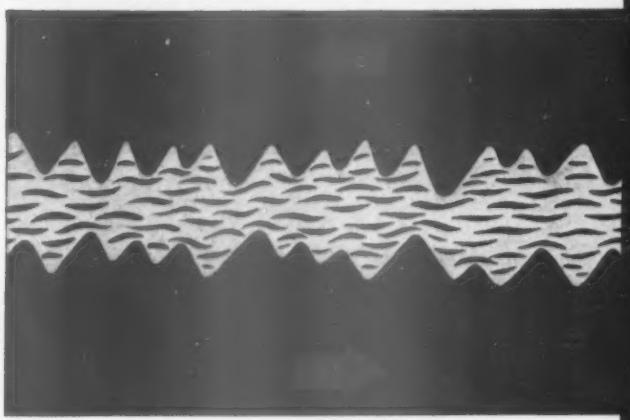
MATERIALS HANDLING 278
MEASURING AND CONTROL 280
MISCELLANEOUS 282
PLANT ENGINEERING 284
PLANT OPERATING 288

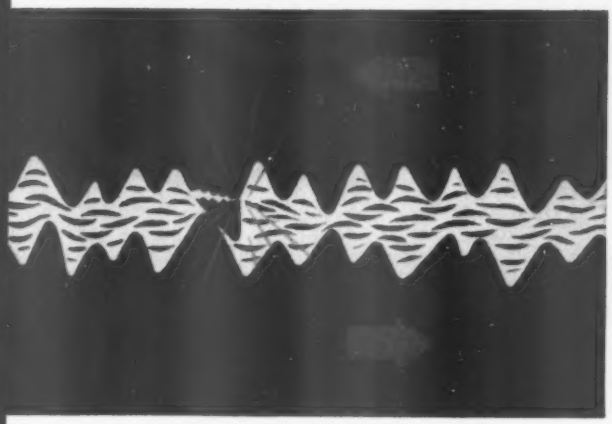
HOW SUNEP PREVENTS GEAR WEAR



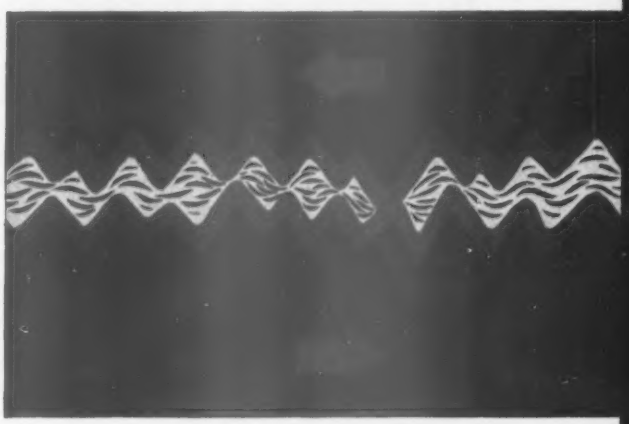
The surface of a gear may seem smooth, but when greatly magnified it looks something like this. The lubricant must keep these jagged edges apart.



With ordinary oil, a thick film is needed to keep these metal surfaces apart. The thickness of the film depends on the viscosity of the oil and other factors.



It is difficult to maintain a thick oil-film in everyday practice. The oil film thins out and semiboundary lubrication results. With ordinary oil, metal to metal contact occurs and gears wear.



Sunep coats the surfaces with a chemically bonded film which is virtually unbreakable. This film, although only about 0.0000001" thick, keeps the surfaces apart, withstands heavy loads and sudden shocks, prevents wear.

Sunep has many advantages. In addition to its outstanding load-carrying ability, it is noncorrosive; it keeps gears and bearings clean; it prevents rusting; it stays put. And its additives do not drop out during use or after prolonged storage. For more information about Sunep and how it protects your equipment, call your nearest Sun office or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. F-10.

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JOE'S DEPARTMENT

ELECTRICAL IDEAS EVERY PLANT MAN CAN USE

By JOE ST. ANDRE • Electrical Editor, FACTORY

• BIGGER, BETTER SHORTS

Ever stop to think about the shambles a short-circuit current might make of your plant? You're on safe ground . . .

. . . *if* you haven't made any changes in your electrical system.

. . . *if* the power company hasn't made any changes in its system.

Those are two very big if's. Take the power company. It has to increase the capacity of the lines feeding your plant (most likely at your request). Other customers have asked for more and more power, too. This means more generating equipment and bigger distribution systems. So, come a short circuit in your plant, the power company can now deliver 5 to 10 times as much power into the "short" as it could a few years back!

Your own expansion doesn't help matters, either. You've probably added a transformer here and there. New sub-stations and larger feeders take care of bigger loads in the plant.

Add up all these changes and you have the element that can make your circuit breakers and fuses inadequate overnight. They'll try to open the fault when it happens. But if the short-circuit currents are beyond their capabilities, don't be surprised when they give up the ghost and blow.

It boils down to this: *Short-circuit currents must be kept in bounds.* You do it by rearranging power circuits, installing current-limiting fuses, putting in current-limiting reactors, installing larger circuit breakers and switchgear. But, before you do anything, you've got to know how much the devices scattered around the plant may be called upon to handle in the way of short-circuit currents. In other words, you've got to make a short-circuit study of your power system.

This sounds like real long-haired stuff. It isn't easy if you have a complicated distribution sytsem. But for most plants the calculations are pretty simple. To show you how to go about it, we asked Peter Lovato and Bob Loewe of Allis-Chalmers to work out a sample problem. You'll find it on pages 162 and 164 of this issue.

• ALL-ALUMINUM CONTROL CENTER

Good news for plants where corrosion is a serious problem! It comes from Westinghouse, which recently previewed a motor control center that's all-aluminum. It weighs 65% less than the usual kind made with steel enclosure and copper bus bars.

Motor control centers are becoming more popular throughout industrial plants. Maintenance men like to work on them. All the controls are in one spot so that they don't have to run around the plant when shooting trouble. And the lighter they are, the easier they are to install.

• SHOW ON THE ROAD

Two mobile exhibits of electric motors, motor drives, and associated controls recently hit the road. Both shows are sponsored by Reliance Electric & Engineering Company. They aim to bring users firsthand news and views of latest developments and newest improvements in this important field.

And it looks to me like a whale of an idea. Not brand-new, to be sure. But how many manufacturers of electrical equipment have ever done this kind of thing? I like it because it gives the rank-and-file a chance to get their hands on real "live" equipment. For many of them, it will be their first chance to get a look-see at some of the equipment that may be soon rolling into their plants. And this introduction will be under the guidance of engineers who can answer those tough questions that seem to come up whenever any new electrical product hits the plant floor.

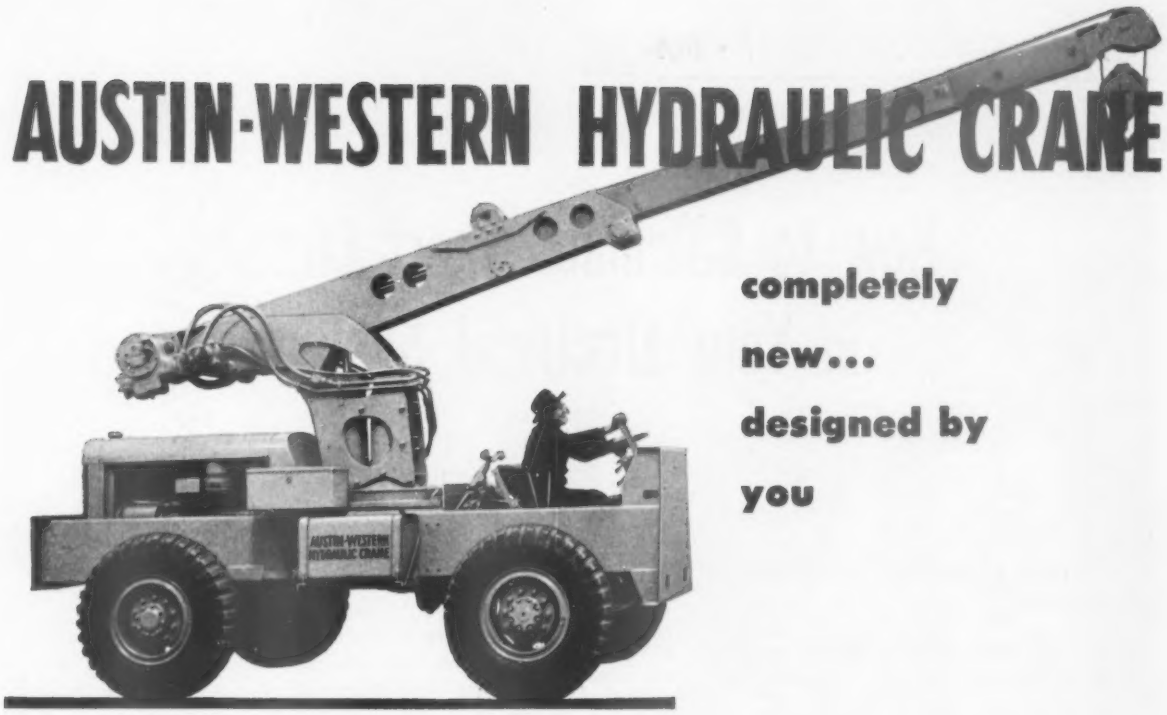
If you want to know when the shows hit your neck of the woods, write Reliance. The address is 1070 Ivanhoe Road, Cleveland 10, Ohio.

• NO SPURIOUS RADIATION

Had any complaints lately from radio or TV fans in your neighborhood? Is your welding epuipment causing any interference? Better look into a new welder which has just been announced by Lincoln Electric Company, Cleveland.

This is an AC job for inert-gas shielded arc welding. But it's different from the ordinary run of welders in one respect. It uses a new method of preventing rectification of current and high-frequency interference with radar, television, and radio communication. No spurious radiation to throw nearby sets out of whack. It meets government requirements now being enforced to free communication from interference by welding operations and other arc-forming equipment. (For more details on TV interference, see FACTORY, July 1953, page 126.)

AUSTIN-WESTERN HYDRAULIC CRANE



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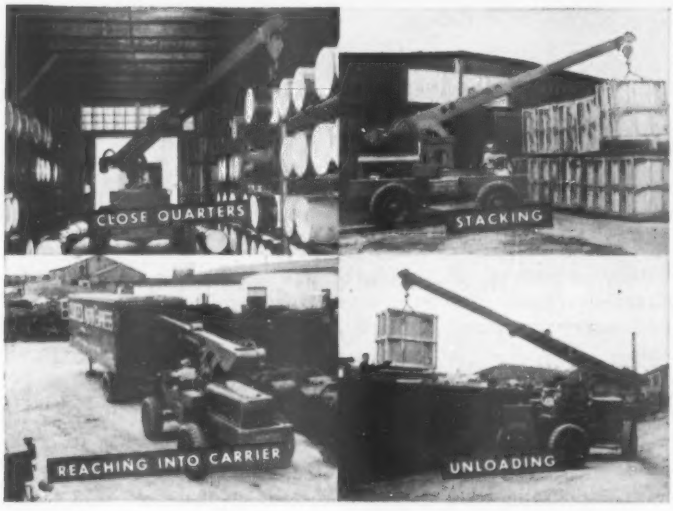

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How to Calculate Short Circuits in Your Electrical System

By R. LOEWE and PETER F. LOVATO
Switchgear Section
Allis-Chalmers Manufacturing Company, Milwaukee

1 · Draw a simple one-line diagram of your power system.

2 · Determine how much short circuit power is available. This you get from your local power company.

Example:

Short circuit power 400,000 kva.

3 · Add in the impedance of each transformer to the diagram. (You get this information from the nameplate of the transformer.)

Example:

Transformer B = 5.5%, B2 = 4.5%, B3 = 5.5%

4 · The impedance of the cables comes next. The impedance (z) of the cable is the square root of sum of the squares of the resistance (r) and the reactance (x).

$$z = \sqrt{r^2 + x^2}$$

At 2400 volts or higher, you only use the reactance. At 600 volts or below, the impedance should be used since resistance becomes an appreciable factor.

Example:

The cable run D1 to the 1000-kva. transformer is 300 feet of 3-conductor 500 MCM cable which has a reactance of 0.128 ohms./mile or 0.00726 ohms. for the 300 ft.

$$X = 0.128 \times \frac{300 \text{ ft.}}{5280 \text{ ft.}}$$

The cable run D2 to the 150-kva. transformer is 200 ft. of No. 2-3 cond. cable. Its reactance is: 0.00634 ohms. The cable run D3 to the 1000-hp. synchronous motor is too short to make any difference in the calculation.

5 · For any synchronous motors, transient reactance must be entered on the diagram. You can get this from the motor manufacturer.

Example:

For this motor transient reactance is 25%. The effect of the induction motors is for the most part negligible and in this case is not figured in the calculations.

6 · All the data we now have must be changed to a common kva. base in order to use it. This base is the largest transformer in the system, 3000 kva. The formula for reducing all reactance and impedances to a common base is:

$$\frac{\text{kva. device}}{\text{kva. base}} = \frac{\text{\% reactance of device on its own base}}{\text{\% reactance of device on common base}}$$

Example:

Reactances are:

Main transformer $\frac{3000}{3000} = \frac{5.5}{X}$ or 5.5%

1000-kva. transformer $\frac{1000}{3000} = \frac{5.5}{X} = 16.5\%$

150-kva. transformer $\frac{150}{3000} = \frac{4.5}{X} = 90\%$

1000-hp. motor $\frac{920}{3000} = \frac{25}{X} = 81.5\%$

In the case of cables, use formula:

$$\% X = \frac{\text{ohms.} \times \text{kva.}}{10 \times (\text{kv})^2}$$

Cable D1 $X = \frac{.00726 \times 3000}{10 \times (2.4)^2} = 0.38\%$ on the 3000-kva. base

Cable D2 $X = \frac{.00634 \times 3000}{10 \times (\text{kv})^2} = 0.33\%$ on the 3000-kva. base

7 · One remaining item needs to be converted in this sample system and that is the maximum short circuit available at the main transformer. In (2) we said that the power company had advised that this was 400,000 kva. To convert, use this formula:

$$\% X = \frac{\text{Base kva.} \times 100}{\text{available short circuit kva.}}$$

Example:

$$\% X = \frac{3000 \times 100}{400{,}000} = 0.75\%$$

Turn the page

Today's most dependable price tag

Maybe there was a day you could take quality for granted in buying plant equipment. But you weren't faced with today's fast-multiplying, high maintenance costs that can quickly cancel out first cost values.

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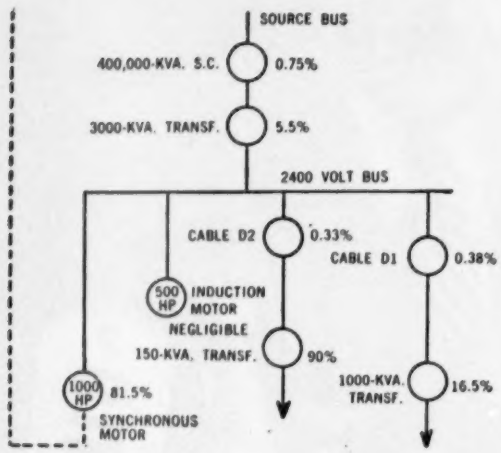

8 · Make a reactance diagram (above) inserting reactances in place of the various devices.

9 · There are two sources of short circuit current in this system. One is the utility system, the other the synchronous motor. Synchronous motors contribute to short circuit currents because the inertia of the mechanical load they are driving will turn the motors into generators when they no longer receive power from the line, and the generated power must be added to the main power source in these calculations. Using formula for short circuit:

$$\text{kva. \% X} = \frac{\text{base kva. x 100}}{\text{available short circuits}}$$

Example:

$$81.5\% = \frac{3000 \times 100}{\text{available short circuits}} \text{ or } 3680 \text{ kva.}$$

10 · We are ready to check the currents on the various parts of the circuit.

Example:

The fuse at disconnect switch has to handle 400,000 kva., the main supply from the power company.

11 · In order to find the short circuit current at any other point in the system the reactances between the power source and the point of short circuit are combined in the same manner as the ohmic values in a direct current circuit.

Example:

For a fault on this 2400-volt bus the total short circuit current would be equal to the sum of the contributions from the power supply and the synchronous motor. That portion from the power supply would be found by adding 0.75% for the power supply to 5.5% for the 3000-kva. transformer, giving a total of 6.25%. This can be changed to an equivalent value of short circuit kva. as follows:

$$\text{Short circuit kva.} = \frac{\text{base kva. x 100}}{\text{\% reactance}} =$$

$$\text{Short circuit kva.} = \frac{3000 \times 100}{6.25\%} = 48{,}000 \text{ kva.}$$

The contribution from the synchronous motor is 3680 kva. (see step 9). The total short circuit kva. on the 2400-volt bus would then be:

3680 kva. + 48,000 kva. or 51,680 kva.

12 · For this example it is also necessary to find the short circuit at the primary terminals of the load center transformers.

Example:

The first step will be to take the total short circuit kva. on the 2400-volt bus and convert it from kva. to percent reactance. In this case, using formula (step 7):

$$\text{\% X} = \frac{\text{base kva. x 100}}{51{,}680} = \frac{3000 \times 100}{51{,}680} = 5.8\%$$

To find the short circuit at the primary terminals of the 1000-kva. transformer, 5.8% is added to the cable reactance of 0.38%, previously calculated, for a total equivalent reactance of 6.18%. This by step 7 will result in:

$$\text{Short circuit kva.} = \frac{3000 \times 100}{6.18} = 48{,}400 \text{ kva.}$$

at primary of 1000-kva. transformer

In a similar manner, the transformer reactance is added to the 6.18% to obtain the short circuit current at the secondary terminals:

6.18% + 16.5% = 22.68%

$$\frac{\text{Short circuit kva.}}{\text{secondary}} = \frac{3000 \times 100}{22.68} = 13{,}230 \text{ kva.}$$

at secondary of 1000-kva. transformer

In the same way, the value of 49,000 kva. is obtained at the primary terminals of the 150-kva. transformer and 3120 kva. at its secondary terminals.

The values of short circuit kva. can be converted to short circuit current at the respective fault points as follows:

$$I = \frac{\text{kva.}}{\sqrt{3}\,E}$$

where I = short circuit current

kva. = short circuit kva.

E = line to line kilovolts at the particular point in the system where the protective devices are located.

Example:

The circuit breakers tied into the 2400-volt bus will have to handle

$$\frac{51{,}680 \text{ kva.}}{1.73 \times 2.4} \text{ or } 12450 \text{ amperes at } 2400 \text{ volts.}$$

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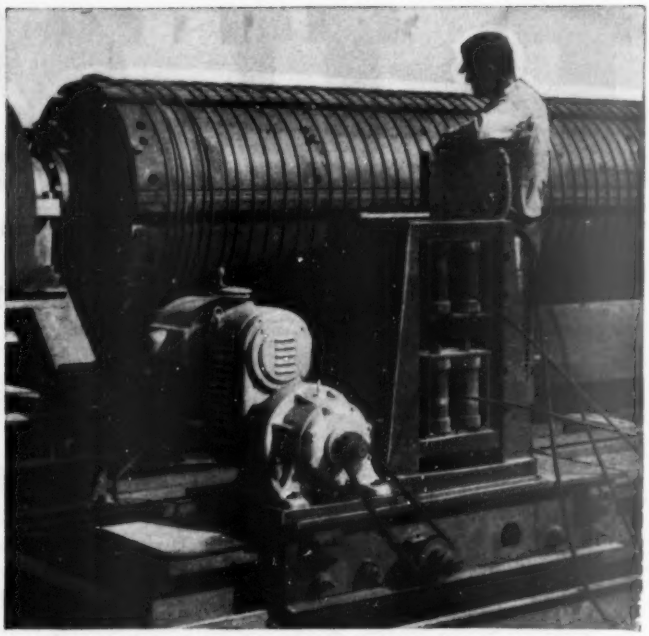
THIS MONTH'S MOTOR TIPS

How Variable Speeds *improve production tempo*



U. S. Varidrive motor operating special drum machine for fabricating circular reinforcing cages for concrete pipe; permits speed variation to suit each diameter of wrapping.

COUNTLESS PLANTS ARE SWITCHING TO VARIDRIVE MOTORS FOR OUTPUT EFFICIENCY

MAKING machines more responsive to the operator's command has resulted in an amazing step-up in production. Machines powered with conventional constant-speed motors "loaf on the job" during many operations, but the same machines driven with Varidrive motors can accomplish one or a combination of these improvements—(1) increase production by the adjustable "overdrive" of accelerated speed; (2) effect better cutting or operating action by setting speed at the precise rpm essential for the job; (3) provide the operator with infinite speeds to coordinate with his rhythm of movement or selection of speed that is, in his judgment, just the exact rpm to produce his best workmanship.

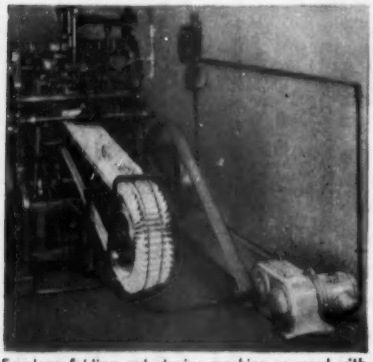
Just as an automotive engine operates at highest efficiency at a certain speed, almost any production machine or powered equipment will produce more where selectivity of motor speeds is provided. In a study of advantages created by the use of variable speeds, the manufacturers of U. S. Varidrive motors have compiled a list of applications covering diversified fields ranging from sewing machine factories to sorghum mills. From most of these interesting applications the design engineer and plant production engineer can learn of uses they can apply to their own sphere of operations.

NO GUESSING OF MOTOR SPEED

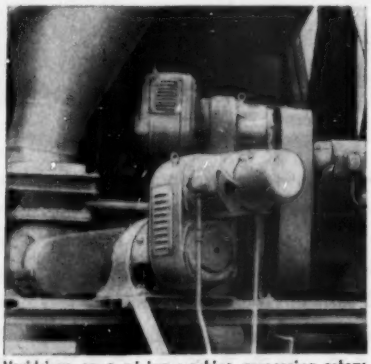
For instance, the design engineer doesn't have to try to guess what the ultimate speed factor will be in order to be sure his machine will deliver the full optimum of production *after* installation. By installing a Varidrive motor he endows his product with speeds instead of a speed; consequently in service his machine presents an "ableness" to adapt itself to a wide range of conditions far beyond his contemplation. If a fixed speed motor operates the machine the design engineer might have guessed wrongly the speed to give it.

REMOVING RESTRICTIONS OF SPEED

The plant production engineer need not be restricted to a set operating speed of a machine. He can, with the Varidrive, experiment with speeds to do a specific job best. For example, a conveyor may at times, when heavily loaded, require slow speed, then higher speed when the load is light, or when parts have to get to a worker's location



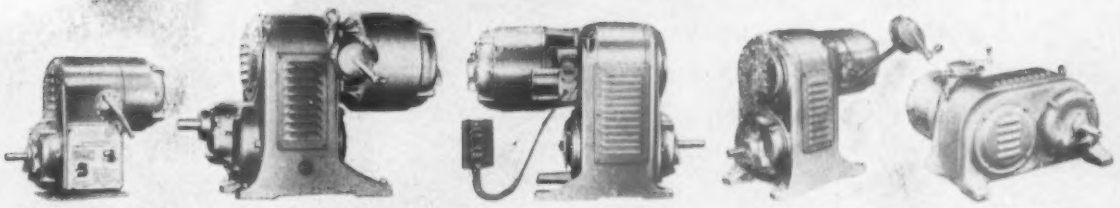
Envelope folding and glueing machine powered with U. S. Varidrive. For different sizes of envelope a different speed is required.



Varidrives on a mixing machine processing rotary drilling oil base. The proper mix depends on the exact speed required to blend materials.

Conveyor travel is controlled for better distribution and timing with a Varidrive. This conveyor is an automatic system for drying printed material.

TYPICAL VARIDRIVE MOTOR TYPES



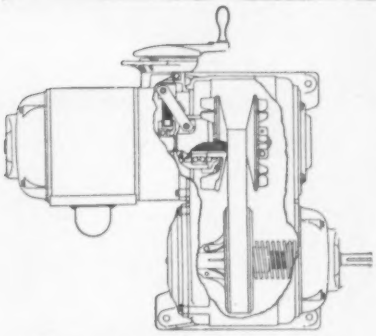
TYPE VA—SMALL H.P.
Low cost model, ¼ to ¾ h.p. 4 to 10,000 rpm. Ratios 10:1. 1 & 3-phase.

TYPE VEU—GH
Upright case with low shaft. Control dial on side.

ELECTRIC CONTROL
Varidrive with Type ERC heavy-duty remote control motor.

REMOTE CONTROL
One of many control arrangements. Control shaft can be extended.

TYPE VE
Horizontal case with control dial on top of motor.



OPERATION OF A VARIDRIVE

By turning control dial, the diameters of the belt discs expand or contract, thus changing fixed speed of motor shaft to variable speed of the take-off shaft. Quiet, shockless, enclosed transmission.

faster. In cutting shafts on a lathe from large to small diameter, frequent change in speed keeps the power tool operating at a uniform lineal travel to get the job completed in the least time. With a Varidrive, the speed can be instantly changed to synchronize with each specific travel or load condition.

Machines turning out different sizes of parts can produce better with variable speeds. If work chatters, feed can be adjusted for best surface speed, longer tool life and finer workmanship.

In experimental processes involving mixing in vats under varying conditions of viscosity, temperature, homogenization or rate of agitation, variable speed plays an important role, which is impossible with a fixed speed motor. The right speed makes all the difference in getting the right mix. With Varidrive no step-cone pulleys, external gears, intermediate speed changers or connections, such as extra chains and couplings are needed. Usually a Varidrive can be direct connected to the prime driving shaft of the machine or equipment.

In pumping and hydraulic control operations variable speed is the answer. Flow, pressure, suction and load can be maintained at just the right equilibrium by a Varidrive. In some machines the exasperating problems of noise, chatter, vibration, over-heating and pulsation contribute to the shortened life of equipment, or affect the quality of the product undergoing processing. These troubles can be invariably "cured" with a Varidrive because the operator can experiment down to a split rpm to get the most sensitive speed to overcome the trouble.

SPEEDS TO FIT TIMING FACTORS

Equipment is frequently required to complete an operation in predetermined time. Variable speed permits a step-up or step-down to establish the right production tempo. In controlling cycles of infra-red baking, drying, heating, soaking, grinding, capping, tumbling, coating, plating, etc., speed movement must be precise—or rejects will cut into profits. What, then, is more logical than to install a Varidrive to provide the nerve-center of speed regulations?

IMPROVEMENT IN OUTPUT

In thousands of plants, the U. S. Varidrive motor has brought about amazing improvements in production. Powered machines have had their output stepped up to 30 percent or more in innumerable instances.

In general, these Varidrives can be obtained in a range of from ¼ to 50 h.p., and for speeds from 2 to 10,000 rpm in ratios of 10:1.

In a research laboratory this Varidrive motor operates test equipment for checking performance characteristics of water pumps.

This combination U. S. Varidrive-Syncrogear powers a special roll grinding machine for cold rolling aluminum sheets, from heavy to light gauge.

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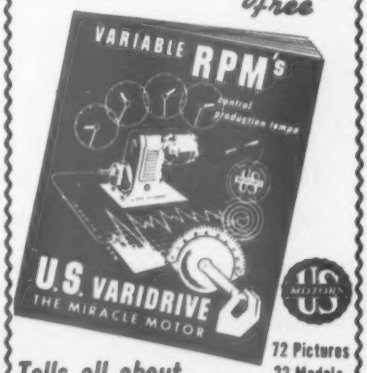

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VALVES & FITTINGS 225
MISCELLANEOUS 228

IN THE NEXT ISSUE... some notes on important late items. More about them next month.

Easy operation and driver comfort were the aims of the designers of the D-424 4000-lb. fork-lift truck. Has a 6-cylinder, 65-bhp. industrial engine, with power transmission system.

Mobilift Corp., 409 S.W. 13th Ave., Portland, Ore.

Arc welder-power unit combination can be changed from one use to the other with the flick of a switch. Powered by an air-cooled gasoline engine. It's portable too.

The Hobart Bros. Co., Hobart Sq., Troy, N. Y.

To examine and inspect hidden spots where direct, close visual inspection is difficult or impossible, a precision optical instrument has been developed. Called Inspecto-Scope.

Badger Sales Co., Inc., 2251 W. Pico Blvd., Los Angeles 6.

Recording turbidimeter for continuous and automatic measuring and recording of number of particles suspended in liquids has been marketed. For use with private water supplies where turbidity has a direct effect on the process.

General Electric Co., Schenectady, N. Y.

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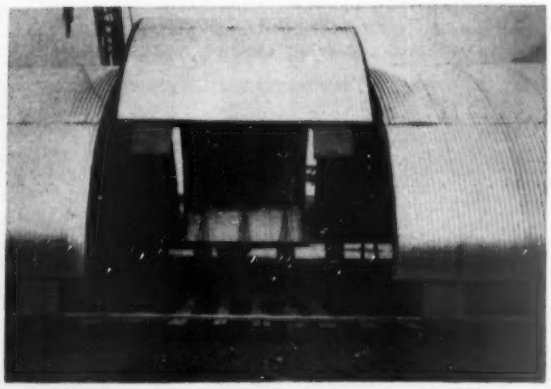
Covered Storage



ACCESSIBILITY to any part of storage area is made possible by section's tilting action. Sections also slide on tracks.

Maker says one complete section can be erected in 1 hour by 3 men working with hand tools. The addition of side skirts, either fixed or hinged, and semi-elliptical end-panels with 8-ft. square sliding doors will complete the above installation.

Offers Easy Access, Mobility

You can get that much-needed outdoor storage space for inventory surplus and standby machinery with a Yard-Stor shelter.

This sectional-type shelter tilts, telescopes, nests, and slides on tracks to allow easy access to stored materials. Not considered a permanent installation, sections can be easily transported, erected, and relocated as storage requirements change.

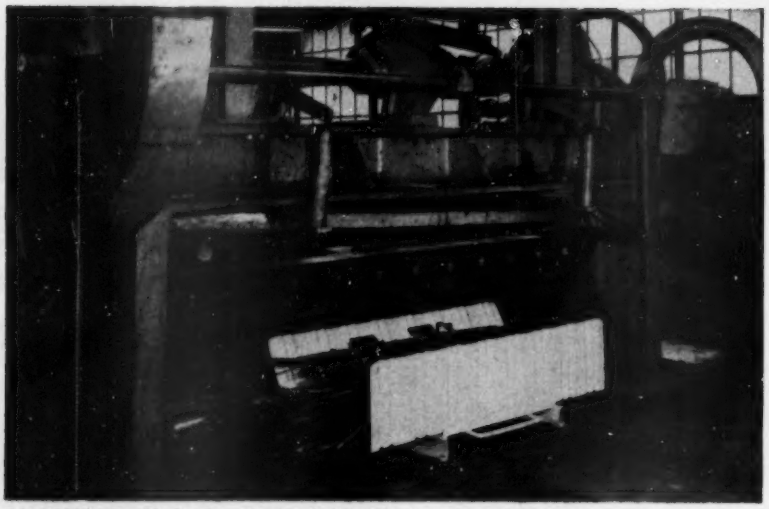
Five panels to construct each section are delivered neatly stacked and bound on a wood skid. Wood ties on a 2-in. to 6-in. cinder bed form a satisfactory foundation and flooring of the storage area.

Either fork truck or crane is used to move the sections. Side skirts of the shelter are adjustable to provide ventilation.

Yard-Stor Shelter Co., 19256 John R. St., Detroit.

NESTING makes loading and unloading of entire storage area easy. Permits storage of Yard-Stor sections in minimum space, too.

Work-O-Matic*
MULTI-DUTY TRAYS...



COLLECTING—*Notice how the Work-O-Matic Multi-Duty Tray back extends to gather in helter-skelter falling pieces. Vertical front compacts to a full load.*

SPOT-CONTROL DUMPING

SAFE TIERING

collect, transfer, store, position and/or dump lengthy parts

A versatile new unit developed especially to handle troublesome shear trimmings, tube and bar cutoffs, blanking skeletons and other hard-to-handle pieces. Designed to be lifted, transferred, tiered, and mechanically dumped with a fork truck . . . at any height from about ground level to full fork lift. Also ideal for work positioning.

Send for complete details. Ask for Catalog No. 83 on the Work-O-Matic Tray and the other cost-cutting Work-O-Matic units that make up the *Work-O-Matic System* . . . the new material handling system being adopted widely by cost-conscious manufacturers and warehousemen. Address The Union Metal Manufacturing Co., Canton 5, Ohio.

*Patent No. 2,445,038. Other patents pending.

UNION METAL
Material Handling Equipment

Begins on page 168

AIR HANDLING

Multi-Zone Air Conditioning Units

Multi-zone air conditioners for heating and cooling, with individual temperature control for each zone or room, have been marketed.

The blow-through type units are designed to serve from 12 to 16 separate zones and have capacities ranging from 7500 to 18,000 cfm.

U.S. Air Conditioning Corp., 3300 Como Ave. S. E., Minneapolis.

■

Adds Five Space Heaters to Line

Five space heaters with inputs of 85,000 or 50,000 btu. have been added to the line of Sonic-Ray Portable Space Heaters.

Model T, rated 85,000 btu., is thermostatically controlled and has automatic safety shut-off.

Model W, rated 85,000 btu., is a portable, combination water and space heater.

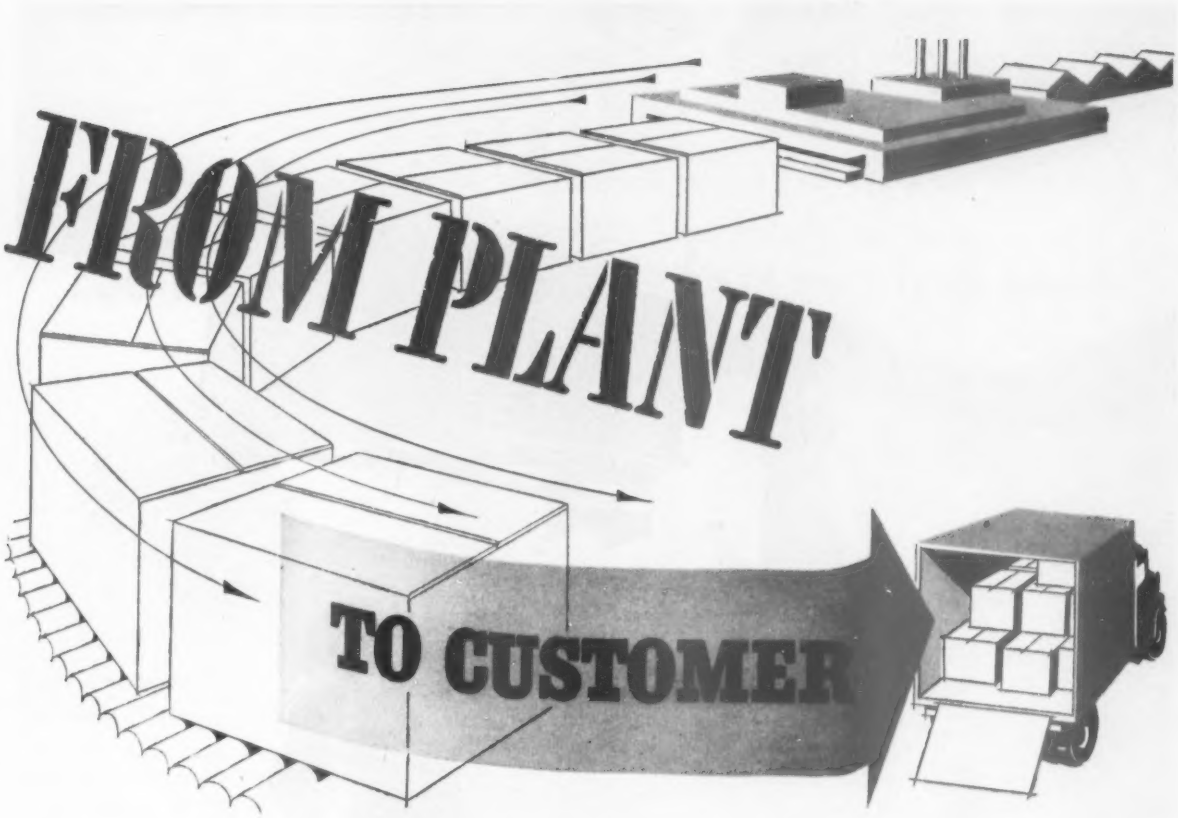
The three other models, rated 50,000 btu., may be used for permanent or semi-permanent installations.

The Bica Co., 1170 N. State St., Girard, Ohio.

■

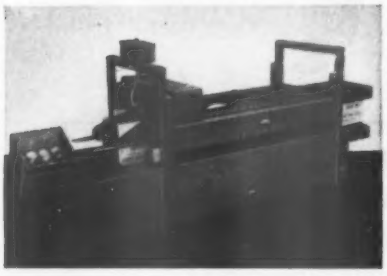
LIGHT-WEIGHT, VERTICAL DELIVERY UNIT HEATERS for steam or hot water have been announced by the Modine Manufacturing Co., Racine, Wis. The lighter weight of these units is said to make installation easy and reduce the ceiling supports required for heavier unit heaters. Available in 26 models.

Turn the page



● Your investment in your product, its packaging and labeling, demands full protection from plant to user—against both abuse and pilferage. Fine shipping cases represent sound economy. And fine case-sealing adhesives—the least costly part of the whole operation—are your final touch of protection.

Whether your methods of applying the adhesives have long been standardized—or include the finest modern case-sealing machinery—there is an Arabol case-sealing adhesive to fit. We believe that — for each of your applications — only one adhesives formula can serve you best. Let us help you find the one right adhesive for each application.



There is an Arabol plant or warehouse near your business—ready to serve you.

We invite the opportunity to submit adhesives samples for you to test in your own plant—under your particular working conditions—for your specific requirements, whatever their nature. That is the one kind of testing that assures you of satisfactory results. Your inquiry to Department 82 will bring a prompt response.

The speedy PACKOMATIC Packer-Gluer for corrugated shipping cases — made by J. L. Ferguson Company. Semi-automatic — applying glue in various spot patterns for fast drying. Weighs 1,150 lbs.; occupies 30 sq. ft. of floor space.

Adhesives? **ARABOL!**

68 Years of Pioneering

THE **ARABOL** MANUFACTURING CO. . . . *a nationwide organization serving major users of industrial adhesives*

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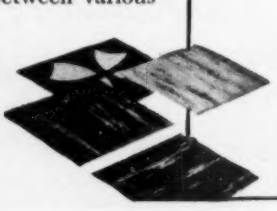
Is your flooring "overhead"?

YES, in the sense that its initial cost and continued upkeep "cannot be charged to any particular part of the work or product." (Webster)

That's why flooring must be carefully chosen ...must last for years without costly repair or replacement. And because floors that look alike aren't alike, it takes an expert to help you.

The Kentile Flooring Contractor is just such an expert...fully qualified by training and experience. He knows the difference between various types of resilient flooring...how the right flooring can increase production, reduce accidents in factory areas...which floors resist grease and oils most effectively and longest—facts that will save you time, money, and work.



Call the Kentile Flooring Contractor* for up-to-date information about these floors

- ✔ *KENTILE ASPHALT TILE*
- ✔ *KENRUBBER TILE FLOORS*
- ✔ *KENFLEX VINYL TILE*
- ✔ *KENCORK FLOORS AND WALLS*
- ✔ *SPECIAL (greaseproof) KENTILE*

KENTILE INC.

*If you don't know the name of your Kentile Flooring Contractor look under FLOORS in your Classified Phone Directory or write Contract Dept., Kentile, Inc., 58 2nd Ave., Brooklyn 15, N. Y.

AUXILIARY EQUIPMENT

Tool Engages Turning Nut

A hexagonal nut socket permits the nut running tool to positively engage the nut while turning.

Designed for use on air and electric powered tools, it is well suited to multiple nut running in mass production applications. The surface drive unit can be applied at a slight angle so nuts can be run close to obstructions.

This socket is available in drive sizes of ½ and ⅝ inches.

Cornwell Quality Tools Co., 1017 Cleveland Ave., Mogadore, Ohio.

■

Lead Plate Type Steam Heater

Here's a lead plate type heater for use in the chemical and processing industries. Maker recommends use of 10 pounds of steam or less.

The heaters, formerly made of steel, are compact, strong, and provide largest practical square footage of heating area in smallest possible volume.

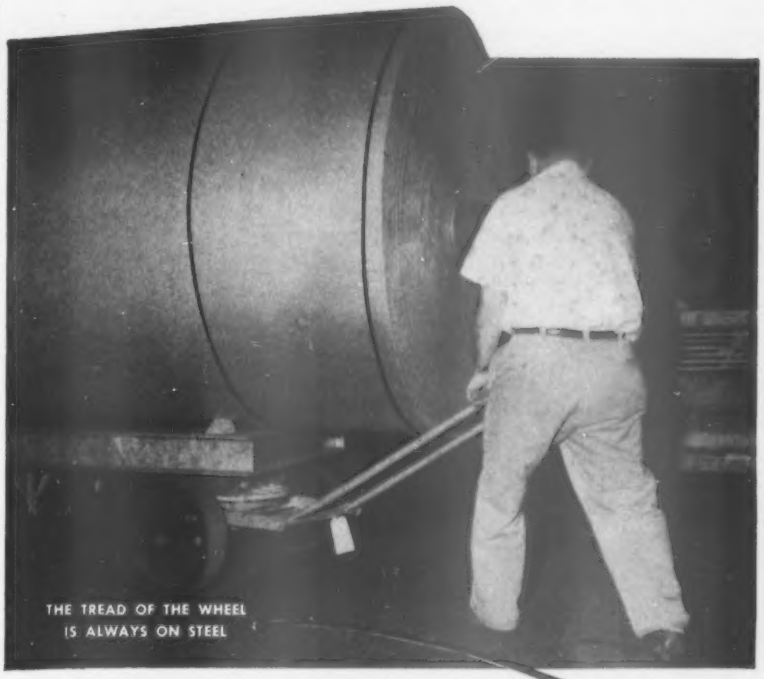
Made in three standard sizes.

Knapp Mills, Inc., 23-15 Borden Ave., Long Island City, N. Y.

Turn the page

LOOK at this FLOOR!

Ten 8000-lb. loads an hour—
yet no sign of wear in 4 years!

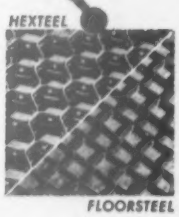


End dangerous, costly surface breaks!

REINFORCE WITH KLEMP

HEXTEEL®

Heavy-duty surface armor
FLOORSTEEL® flexible floor armor



• Check into what your company has spent for floor surface maintenance in the past 5 years. You may have a rude shock! Then, realize that no properly installed HEXTEEL or FLOORSTEEL reinforced floor has EVER worn out—and you will experience a happy awakening from the nightmare of excessive maintenance, damaged equipment and materials, plus personal injury risks. Send for FREE facts *now!*

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Please send me information about *Hexteel* and *Floorsteel* as used by more than 250 famous industrial and commercial firms.

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City_____ State_____

FM-10

DESIGN IN STEEL CUTS WEIGHT 48% LOWERS COST 52%

PROPER design in welded steel can cut manufacturing costs an average of 50% on many products. In addition, steel designs are stronger, more rigid, can be fabricated with less material and fewer shop manhours.

The machine arm shown in figure 1 originally required 182 pounds of gray iron and cost $38.25 to cast and machine.

By converting to welded steel construction the arm (Fig.2) can be built for only $20.06 and weighs but 86.8 pounds. Since steel is three times stronger and twice as rigid as gray iron, the wall sections of the steel design are 3/16" plate instead of the original 5/8" dimension. As a result, the weight saving is 48% which is particularly important because of inertia factors on this particular component.

Utilizing standard mill shapes, the rugged steel box-type construction is fabricated at 52% less cost using simple fixtures. Machining and finishing is easier and takes less time, to increase shop efficiency.

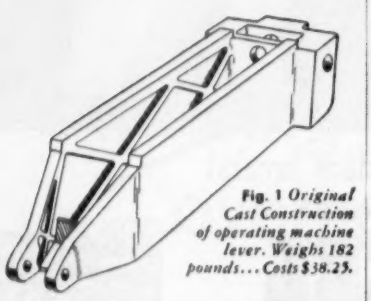


Fig. 1 *Original Cast Construction of operating machine lever. Weighs 182 pounds... Costs $38.25.*

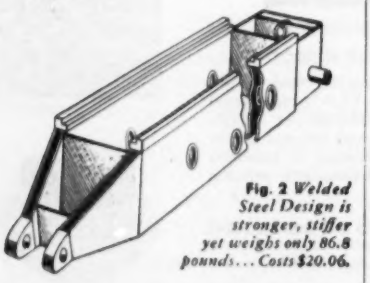


Fig. 2 *Welded Steel Design is stronger, stiffer yet weighs only 86.8 pounds... Costs $20.06.*

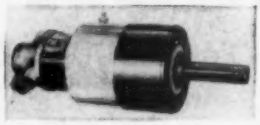
HOW TO DESIGN FOR STEEL

Machine Design Bulletins giving latest methods for converting product designs to steel with Lincoln's Weldesign System are available by writing The Lincoln Electric Company, Cleveland 17, Ohio. Write Dept. 3706.

THE LINCOLN ELECTRIC COMPANY
CLEVELAND 17, OHIO
THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING EQUIPMENT

NEW AUXILIARY EQUIPMENT

Begins on page 173



Air Motors Are Compact, Reversible

Here's a line of air motors featuring low air consumption for such applications as closing valves, operating agitators, and tilting tables. The motors are compact and instantly reversible, the maker says.

Made in ratings from ½ to 2¾ hp., with 12 speed and torque combinations. Consistent torque output is achieved on low as well as high air pressure.

Keller Tool Co., Grand Haven, Mich.

■

Split Roller Bearings for Difficult Locations

Roller bearings split right down to the shaft are available for use in difficult or impossible bearing locations.

Can be mounted where conventional type solid bearings are unusable. Races and rollers are high carbon-chrome alloy steel.

Available in the fixed type (grooved-race) and the expansion type (floating). Come in a variety of sizes. Not interchangeable with U. S. Standard Bearings.

Cooper Split Roller Corp., 700 Cedar Blvd., Pittsburgh 28.

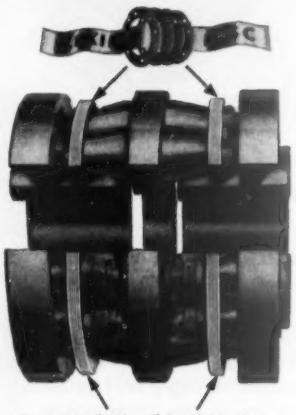
■

ACIDPROOF SUMP PUMP that will find many uses in industries where corrosive and abrasive solutions are employed has been marketed by The Galigher Co., 545 W. 8th South, Salt Lake City. The welded steel vertical pump is completely rubber lined. Can be used where heads up to 35 feet and flows to 75 gpm. are required. A float switch is available to control sump delivery.

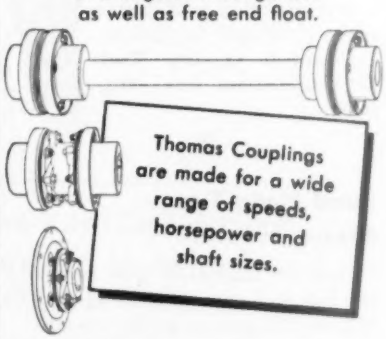
Turn the page

Specify **THOMAS** ALL METAL
FLEXIBLE COUPLINGS
for Power Transmission to avoid Costly Shut-Downs

DISTINCTIVE ADVANTAGES	
FACTS	EXPLANATION
NO MAINTENANCE	Requires No Attention. Visual Inspection While Operating.
NO LUBRICATION	No Wearing Parts. Freedom from Shut-downs.
NO BACKLASH	No Loose Parts. All Parts Solidly B .ted.
CAN NOT "CREATE" THRUST	Free End Float under Load and Misalignment. No Rubbing Action to cause Axial Movement.
PERMANENT TORSIONAL CHARACTERISTICS	Drives Like a Solid Coupling. Elastic Constant Does Not Change. Original Balance is Maintained.



Patented Flexible Disc Rings of special steel transmit the power and provide for parallel and angular misalignment as well as free end float.



Thomas Couplings are made for a wide range of speeds, horsepower and shaft sizes.

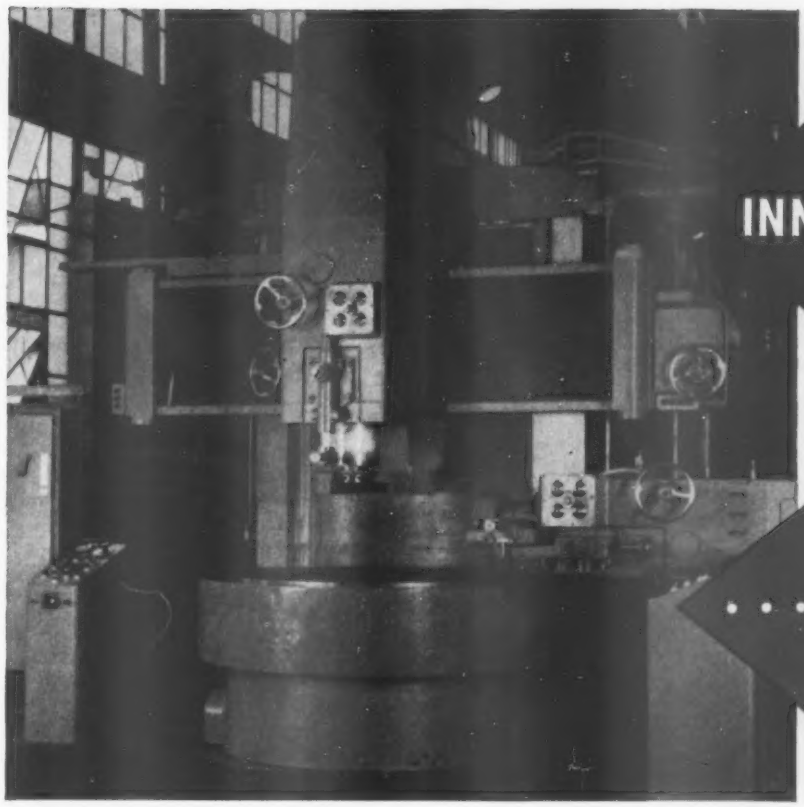
THE THOMAS PRINCIPLE GUARANTEES PERFECT BALANCE UNDER ALL CONDITIONS OF MISALIGNMENT

NO MAINTENANCE PROBLEMS

ALL PARTS ARE SOLIDLY BOLTED TOGETHER

Write for our new Engineering Catalog No. 51

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA, U.S.A.



AN INNOVATION *in*

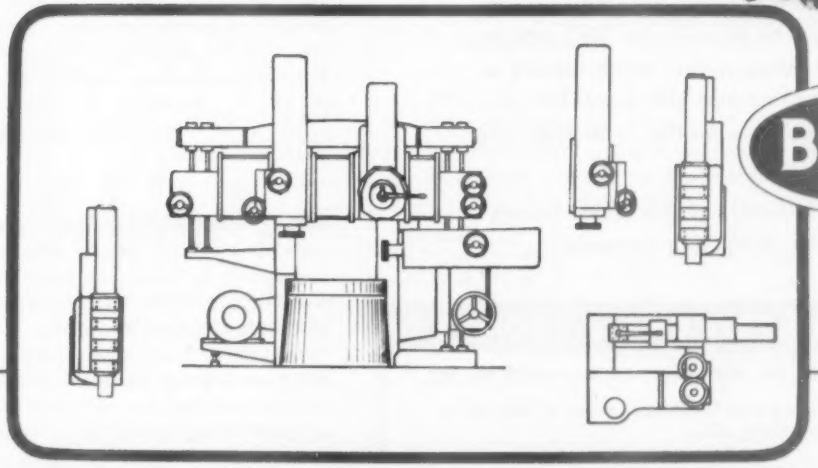
VERTICAL CHUCKING GRINDING MACHINES

NOW . . .
Practical Versatility

BY . . .
Grinding, Boring, Facing or Turning with several head combinations available.

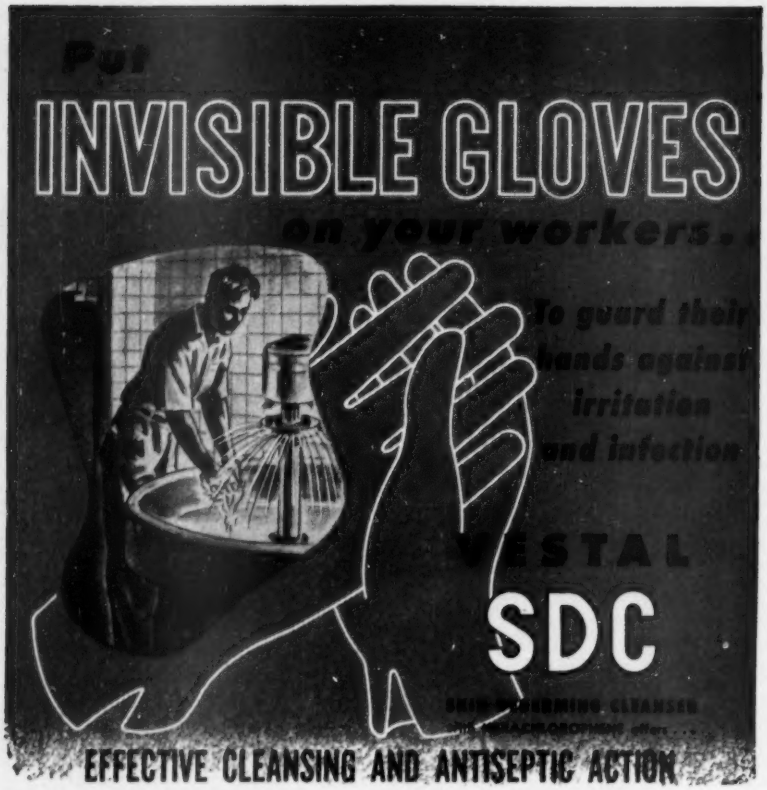
ASSURED
Sufficient horsepower for regular machining cuts first . . .
Grinding work next . . . on the SAME machine.

POSSIBLE HEAD COMBINATIONS on BULLARD VERTICAL CHUCKING GRINDING MACHINES



THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT



The answer to industrial dermatitis is effective cleansing combined with antiseptic action. Vestal—SDC (Skin Degerming Cleanser) provides both. It cleans efficiently, removing irritants such as cutting oils, lubricating oil, chemicals and solvents; it provides antiseptic protection against secondary infections arising from cuts, abrasions and chemical irritation . . . promoting quick healing of injured skin without crippling, infectious complications.

Daily hand washing with Vestal—SDC forms an invisible but protective film on the skin. For SDC contains the antiseptic agent, Hexachlorophene, which remains on the skin after the hands are rinsed and dried. This antiseptic film provides a continuous barrier to infection and disease transmission.

Vestal—SDC lathers instantly; quickly cleans heavily-soiled hands . . . Available in liquid or powder.

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☐ Please send FREE copy product data brochure describing SDC.

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Address_____

City_____ State_____

NEW AUXILIARY EQUIPMENT

Begins on page 173

Automatic Water Drain for Sumps and Tanks

A sump drain that automatically removes water and sludge from line sumps, tanks, and aftercoolers has been marketed. However, it doesn't separate contamination from moving compressed air.

Pressure drop is very small because of instantaneous opening and closing. Draining capacity is better than 250 gph., maker says.

Wilkerson Corp., 3409 S. Platte River Dr., Englewood, Col.

■

AN INTEGRAL GEARMOTOR SERIES FROM 1 TO 15 HP. has been announced by the Century Electric Co., 1806 Pine St., St Louis 3. The motors, offered in a wide range of speeds, in single, double and triple gear reductions, are an extension of the company's line. Available with constant and variable speeds and with protective frames to operate under most atmospheric conditions.

■

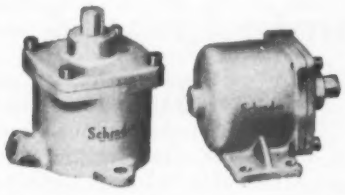
SPHERICAL BEARINGS AND SPHERICAL ROD END BEARINGS, known as Adjusta-Ball, provide a means of adjusting the ball race to provide accurate positioning of the bearing, the maker says. Once adjusted the bearing race inserts are locked firmly in position by a set screw. Designed by Lincoln Park Industries, Inc., Lincoln Park 25, Mich.

■

OFFSET-SHAFT MOTOREDUCER with mounting and power-take-off versatility is being produced by the Reuland Electric Co., Alhambra, Calif. Connection of the output shaft to loads above, below, right, or left of the drive motor is accomplished by rotating the endbell. Available in ½- to 5-hp. units, with output speeds from 190 to 520 rpm.

Turn the page

Simplify any work-holding problem



Base Mounted Leg Mounted

CLAMPAIR CYLINDERS

Schrader ClampAir Cylinders are available either base or leg mounted, in 1", 2¼" and 3" diameters delivering a 2" or 1" stroke. A wide selection of Schrader Valves is available, too, to operate ClampAirs.

Watch a worker making ready for a simple drilling operation. He places the work in a fixture and hand-clamps it. With everything all set to go, you'll find he takes as much as ten seconds just to grip the work tightly in the clamp.

Multiply that by thousands of machine operations. You'll find a substantial portion of work time is used up *before* actual production begins.

You can eliminate nearly all of this lost time with the new Schrader ClampAir Cylinder... with no more effort than opening a valve.

The ClampAir—actually a bantam air cylinder—has plenty of power to hold work firmly—with the same force every time. *No more rejects from uneven holding forces!*

ClampAir will serve you well on drill presses . . . milling machines . . . gluing operations—and scores of other places all over the shop. In all of these, production can be boosted with ClampAir. And remember—since ClampAir is basically a push-type air cylinder, you can use it any time you need a short, hard stroke.

It's easy to find out how ClampAir can increase production and worker efficiency. Write, outlining the applications in which you are interested—or fill out the coupon below.

Schrader
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products
control the air

Air Cylinders • Operating Valves • Press & Shear Controls • Air Ejection Sets • Blow Guns • Air Line Couplers • Air Hose & Fittings • Hose Reels • Pressure Regulators & Oilers • Air Strainers • Hydraulic Gauges • Unifiare Tube Fittings

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Division of Scovill Manufacturing Company, Incorporated
457 Vanderbilt Avenue, Brooklyn 38, N. Y., Dept. N-5

I am interested in more information on.....

Name _____ Title _____

Company _____

Address _____

"FASTER PRODUCTION WITH JADE-LITES," thanks to the LUSTRA MAN.

[says The Philadelphia Thermometer Company]

THIS REPORT from Mr. L. W. Scanlan, General Manager, may help you improve your own operations:

"The ordinary slimline and fluorescent tubes formerly used in our production department caused an annoying amount of glare. At the suggestion of our local Lustra Man we installed Lustra Jade-Lite Fluorescent Tubes and immediately found that both glare and eyestrain were eliminated... with the end result that production has been importantly speeded."

• • •

Like other plant men the country over, you'll find that your local Lustra Man can reduce glare and step up the "see-ability" required for top efficiency in precision work areas... with Lustra Jade-Lite Fluorescent Tubes.

More than that, your Lustra Man is thoroughly qualified to solve practically any individual lighting problem and give you added lighting effectiveness at less cost with the full quality line of Lustra *Double Duty* Lamps, Fluorescent Tubes and allied electrical products.

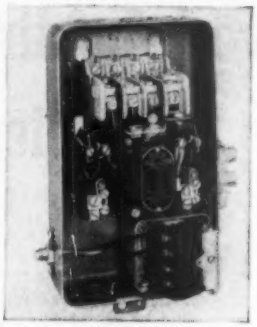
Write us for literature giving the whole Lustra story.
Lustra Corporation, Dept. T-10, 36 Washington St., B'klyn 1, N. Y.

Lustra
AMERICA'S DATED LAMPS

DOUBLE DUTY REFLECTOR LAMPS. INCANDESCENT LAMPS. FLUORESCENT TUBES. SPOTLITES AND FLOODLITES. RUGGED DUTY LAMPS. FLUORESCENT FIXTURES AND STARTERS

WHAT'S NEW IN EQUIPMENT
Begins on page 168

ELECTRICAL EQUIPMENT



Magnetic Starter Pressure Operated

This pressure-operated magnetic starter was designed for use on pumps and air compressors. Combines starter, pressure switch and automatic unloader.

A package control, it saves wire, conduit, and installation labor, plus reducing tube requirements, the maker claims.

Available in 3 sizes up to 5 hp. at 220-550-volts single phase or to 10 hp. at 440-550-volts polyphase.

Furnas Electric Co., McKee St., Batavia, Ill.

■

Safety Switches Have Dust-Proof Enclosures

NEMA XII safety switches in special industry enclosures will exclude dust, dirt, oil, and coolants.

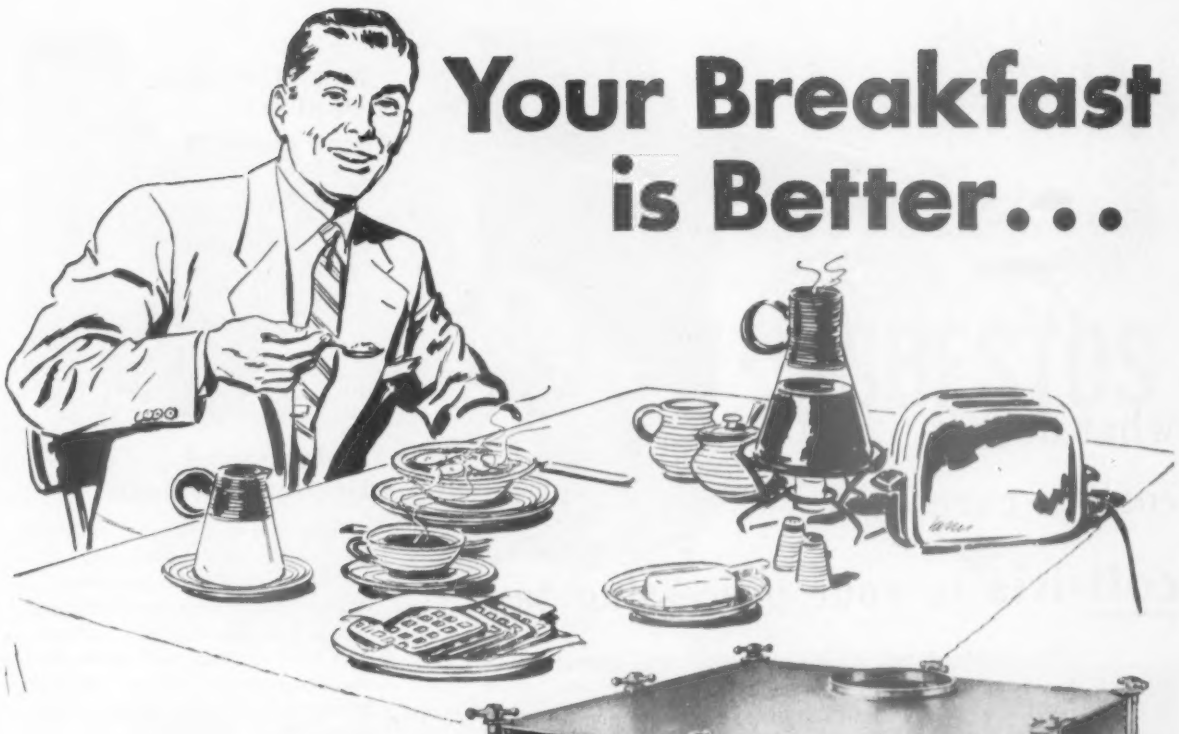
Because each installation is "tailor-made," no conduit openings or knockouts are provided.

Switches with 30-, 60-, 100-, and 200-amp. ratings are being produced in either 240-volt a-c/250-volt d-c, and 600-volt a-c/d-c.

Square D Co., 6060 Rivard St., Detroit, Ill.

Turn the page

Your Breakfast is Better...

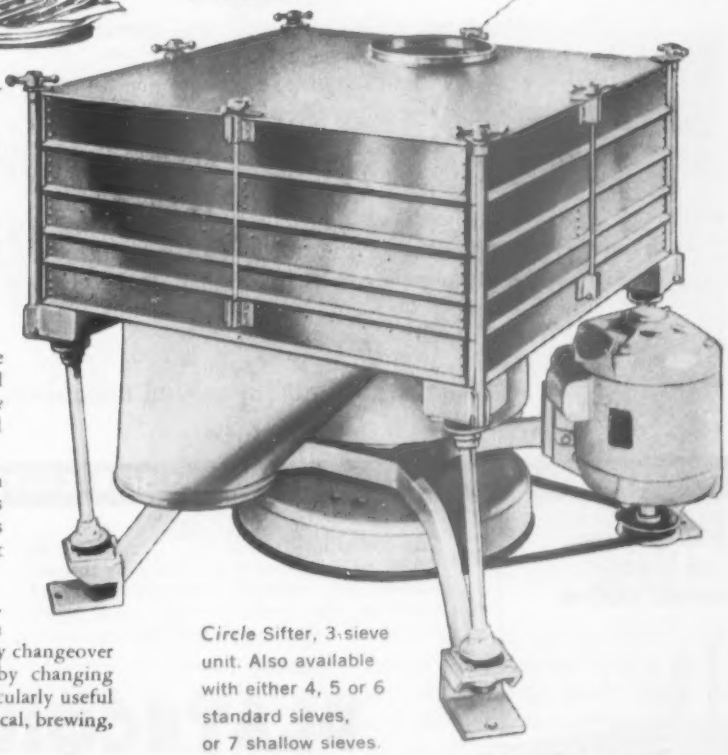


...because of Allis-Chalmers Sifters!

A LARGE SHARE of the food items on the typical family breakfast table are processed by Allis-Chalmers Sifters. Shown is the *Circle* Sifter, newest of a complete line designed and built for a wide variety of industries.

This multi-purpose sifter—like others in the line—cleans and screens not only foods such as flour, cereals, sugar, coffee and spices but also plastics, cork, talc, drugs and a host of other dry granular products.

Dust-tight, compact, self-contained . . . operating with a true, gyratory sifting motion . . . the *Circle* Sifter is designed for quick, easy changeover from one application to another, simply by changing sieves. This adaptability factor makes it particularly useful in the food, animal feed, grain milling, chemical, brewing, distilling and pharmaceutical industries.



Circle Sifter, 3-sieve unit. Also available with either 4, 5 or 6 standard sieves, or 7 shallow sieves.

Circle is an Allis-Chalmers trademark.

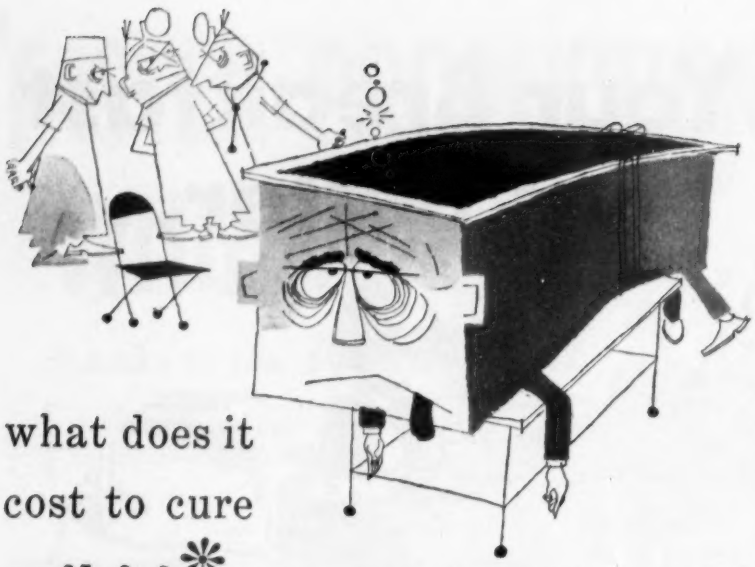
Machinery and Equipment to Help People Produce More, Have More—*LIVE BETTER!*

ALLIS-CHALMERS

C-5654

GENERAL MACHINERY DIVISION

PLANTS IN: MILWAUKEE, WIS.—PITTSBURGH, PA.—NORWOOD, OHIO—BOSTON, MASS.—TERRE HAUTE, IND.—MONTREAL, P. Q.—ST. THOMAS, ONT.



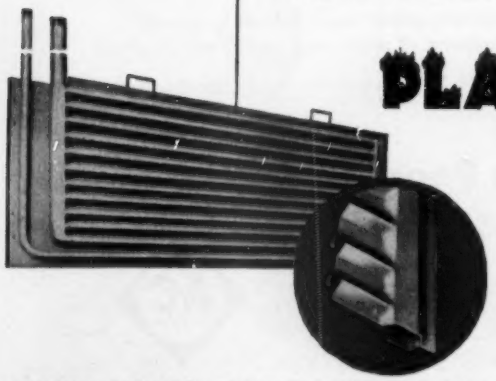
what does it
cost to cure
coil-itis* in your processing tank?

The constant care it takes to keep tanks operating when they're plagued with coil-itis is extremely costly. Downtime, and all the other maintenance time, slow heating and cooling ills of using old-fashioned pipe coils can be cured with Platecoils. As revolutionary as the new wonder drugs, Platecoils save as much as 50% in initial cost. They take 50% less space in the tank. They simplify maintenance and save hours of downtime. Compared to the hours it takes to clean and replace pipe coils, Platecoils can be cleaned and replaced in no time at all . . . without dumping the solution. It costs less to cure coil-itis with Platecoils than to suffer its evils. **Write for bulletin P60 today!**

PLATECOILS SAVE 50% IN HEAT TRANSFER COSTS

PLATECOILS COST LESS TO BUY, INSTALL, MAINTAIN

The Newcomb-Detroit Co., Grand Rapids Division, has found it is less costly to buy, install and maintain Platecoils than to fabricate pipe coils in their own plant. Ask about other case histories.



PLATECOIL

REPLACES PIPE COILS

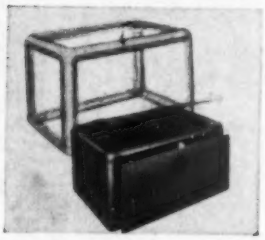
*

Coil-itis — Diagnosed as tank heating and cooling problems. **Platecoils** — the prescription for solving pipe coil problems.

PLATECOIL DIVISION, TRANTER MANUFACTURING CO., LANSING 4, MICHIGAN

NEW ELECTRICAL EQUIPMENT

Begins on page 178



Prefabricated Electronic Cabinets

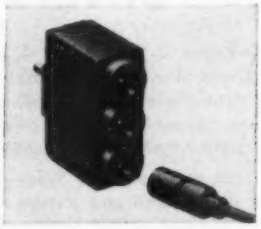
Here's an easy way to construct electronic cabinets of any size with no special tools required.

Erector-set-type prefabricated parts such as die-cast corners, extruded sections, and other special components are used. Bolted together they form modern, fully radio-fused cabinets, of any shape or size.

Telescopic mountings and hardware are also available.

British Industries Corp., 164 Duane St., New York 13.

■



Waterproof Toggles

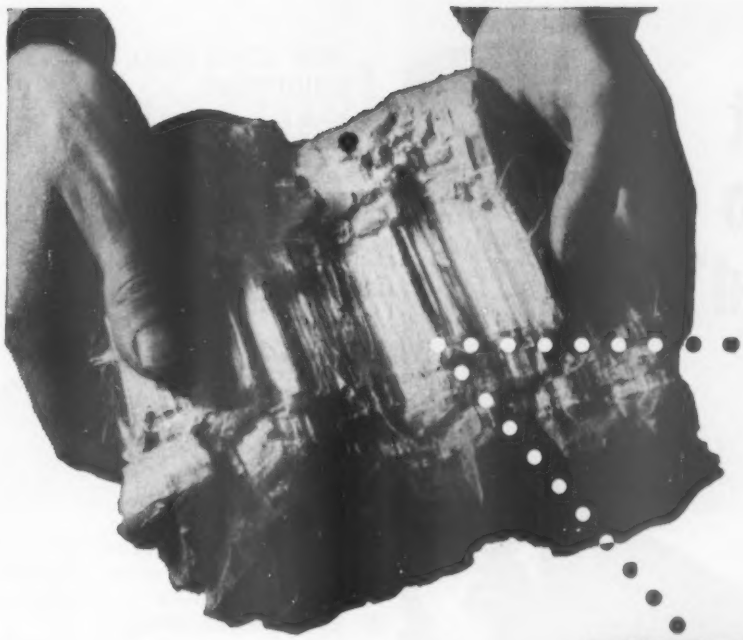
Waterproof toggle switches featuring a molded-in female connector receptacle for assembly with male waterproof plugs have been marketed. Called Type ACM.

Metal parts are plated for corrosion resistance. Also, switches will withstand severe shock and vibrations, maker claims.

Available in a variety of ratings, each switch can be either SPST or SPDT.

Riverside Mfg. and Electrical Supply Co., 10228 Michigan Ave, Dearborn, Mich.

Turn the page

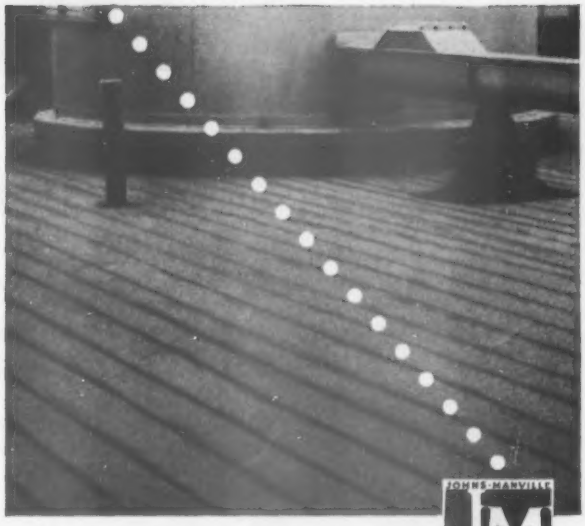


From the ageless mineral ...ASBESTOS

...comes the smooth-surfaced built-up roof

FLEXSTONE*

which provides a flexible covering of stone...



Because they are made of asbestos, the felts of a Johns-Manville Flexstone Built-Up Roof won't burn, rot or dry out from the sun. They need no periodic coating . . . provide lasting service and protection.

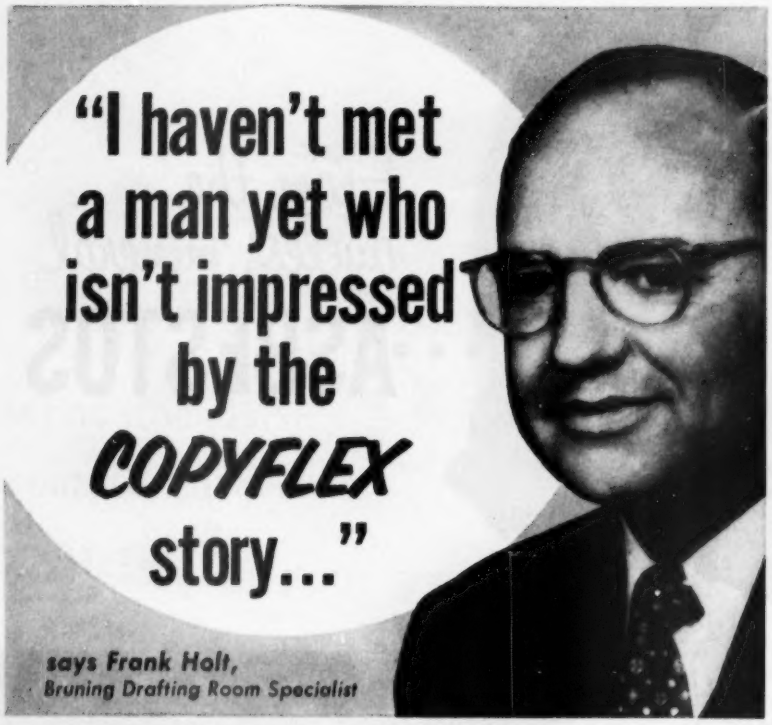
Flexstone Built-Up Roofs are *smooth-surfaced* . . . permit thorough drainage . . . make damage easy to locate and repair. These superior advantages are also provided by the J-M Flexstone *Special* Built-Up Roof . . . developed especially for dead-level decks.

For complete information about Flexstone Roofs and the J-M Asbestile* Flashing System that provides thorough water tightness and effective treatment for critical roof areas, send for folder BU-51A. Write Johns-Manville, Box 158, New York 16, N. Y. In Canada, write 199 Bay St., Toronto 1, Ont.

*Reg. U. S. Pat. Off.

Johns-Manville FLEXSTONE Built-Up Roofs

ASBESTOS CORRUGATED TRANSITE* • ACOUSTICAL CEILINGS • DECORATIVE FLOORS • MOVABLE WALLS • ETC.



"Everybody knows operating costs are high these days. So engineers and draftsmen get a pleasant surprise when they find they can save plenty by whiteprinting the Copyflex way.

"With the high-volume Model 93 COPYFLEX, for instance, they can copy anything drawn, written, typed or printed for *less than 2¢ a sq. ft.* And they get dry, ready-to-use prints in a matter of *seconds.*

"They like its continuous high-speed production, and the efficient vacuum feed that permits easy insertion of curled originals.

"Elimination of expensive ventilation systems and plumbing makes a big hit, too."

From prints to pencils, Bruning-trained men like Mr. Holt can take care of every drafting room requirement. They give "in-person" attention to your needs and fast service on all kinds of drafting room equipment. They help you turn out better work in less time at lower cost. For more facts and figures on Copyflex, send coupon today.

MODEL 93 COPYFLEX MACHINE

From Pencil to Print, only BRUNING has everything

- COPYFLEX Whiteprinters
- Drafting Machines
- Tracing Paper and Cloths
- Surveying Equipment
- Drafting Furniture
- Drawing Instruments
- Sensitized Papers, Cloths, Films
- Electric Erasers
- Complete Line of Drafting Supplies and Equipment

B.3.6

CHARLES BRUNING COMPANY, INC., Dept. F103
4700 Montrose Ave., Chicago 41, Ill.

☐ Please have a Drafting Room Specialist call.
☐ Send me free booklet on COPYFLEX 93.
☐ Show me COPYFLEX in action (no obligation).

Name.....Title.....
Company.....
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City.....Zone....State.....

OFFICES IN PRINCIPAL CITIES

BRUNING

Everything for the Engineer and Draftsman

NEW ELECTRICAL EQUIPMENT

Begins on page 178

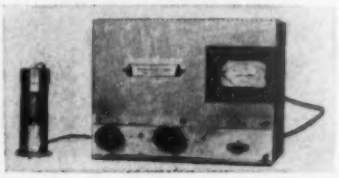


Photo-Responsive Relays and Meters

Photo-relays and photometers suited to a wide variety of industrial control duties have been developed.

Each model is specially adapted to a job. The model pictured above is for measuring radiation of glowing filament sources.

The instruments have range selectors, and zero reset and control switches.

Techniflex Corp., Port Jervis, N. Y.

■

Automatic Relay With Trip Lockout

An automatic reclosing relay designed primarily as a control on circuit breakers has been marketed. Has a built-in instantaneous trip lockout feature.

Adjustable reclosing time sequences of 60, 90, 180, and 360 seconds are provided by a synchronous motor.

Westinghouse Electric Corp., Box 2099, Pittsburgh 30.

■

Tubing and Sleeving for Class H Insulation

A Class H insulation tubing and sleeving designed to retain flexibility throughout the life of the equipment to which it is applied is now available.

Called BH "1151," it is coated with G-E's SE-100 silicone rubber compound.

The insulation is produced in 27 sizes.

Bentley, Harris Mfg. Co., Conshohocken, Pa.

Turn the page

Westinghouse

TO BE SURE...

General Contractor--The Austin Company

Contractors-- Asbestos Erectors, Bound Brook, N. J.

put sidewalls of Carey stone on their new TV-radio factory!

By choosing Careystone Corrugated, Westinghouse made sure of low maintenance costs and absolute fire safety for the lifetime of their new TV-radio plant at Metuchen, N. J. For Careystone never needs preservative treatment, will not rot, rust, corrode or burn . . . actually *gains* in strength with exposure to weather. Careystone resists termites and rodents, too. And its attractive, natural gray color saves painting expense.

Careystone is made of virtually indestructible asbestos and Portland cement, corrugated for great structural strength. It is quick, inexpensive and easy to erect. Comes in big 42" x 8' sheets that cover fast. Can be applied over steel or wood framing; sawed to fit irregular areas.

Careystone is suitable for exterior or interior walls, partitions, storage buildings, to highlight a few uses. If you plan a new plant, or addition, give serious thought to the advantages only Careystone can deliver. Ask your Carey Industrial Sales Engineer for the latest Careystone Corrugated Manual No. 52–84 fact-filled, money saving pages. Or, write on your letterhead for a copy today.

Carey 85% magnesia insulation materials have weathered 24 years of continuous service on the fractionating tower and vapor lines of these atmospheric and vacuum stills at Gulf Oil Corporation's Port Arthur, Texas plant.

Built-up roofing at the White Motor Co. truck plant in Cleveland, Ohio. Kept in prime condition by tough, lasting Careyclad and Carey Fiber Coating–formulated to withstand the grinding abrasion of weather, corrosive fumes, and time!

Over 100,000,000 crossings without one cent for repair or replacement! That's the toughness and durability record of Carey Asphalt Plank surfacing on the Harlem River span of famous Triborough Bridge in New York City!

Get Your Copy of This Valuable Manual.

84 fact-crammed pages listing uses for Careystone, erection details, estimating procedures. Hundreds of "how to" diagrams. Write on your letterhead for your FREE copy right away.

Write Dept. FMM-10

FROM THE HOUSE OF CAREY—

Careystone Corrugated and Flat Sheets • Built-up Roofing • Bonded Roofs • Super Light 85% Magnesia Insulation • Asphalt Plank • Asphalt Paints and Coatings • Other Famous Products for Industry Since 1873

Carey

THE PHILIP CAREY MFG. COMPANY, LOCKLAND, CINCINNATI 15, OHIO. IN CANADA: THE PHILIP CAREY CO., LTD., MONTREAL 3, P. Q.

P&H OVERHEAD CRANES

Why P&H builds the entire Crane

. . . including electrical equipment!

If you want the utmost in service from your cranes, insist that they be job *engineered* by P&H — not an assembly of components from various sources. For example, general purpose electric motors don't stand the gaff of crane service like those *designed* for the job. That's why P&H builds its own motors, brakes and controls — with all characteristics *properly suited* to crane operation: P&H electrical equipment throughout is your assurance that all functions are perfectly coordinated. It means better service, less maintenance.

This policy of complete quality control — of single manufacturing responsibility — better service — made P&H the leading builder of overhead traveling cranes. Continuous improvement, far ahead of the field, has extended this leadership. Benefit by it when you buy your next cranes.

*T.M. of Harnischfeger Corporation for electromagnetic type brake.

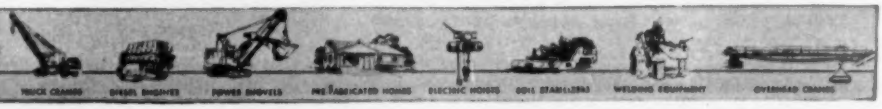
P&H OVERHEAD CRANE DIVISION

HARNISCHFEGER CORPORATION

Milwaukee 46, Wisconsin

P&H MAGNETORQUE* AC Crane Control is the most important development in crane service in 25 years.

the P&H Line



MAINTENANCE TOOLS SUPPLIES

Portable Pipe Bending Machine

Here's a pipe bending machine that can be carried by hand from work area to work area.

Power for bending is supplied by a ¾-hp. motor. It will bend from ½- to 1¼-in. IPS up to 180 degrees. One man can do an average of 60 bends per hour with this machine, the maker claims.

Limit switches to avoid overtravel are factory set. Can be bench mounted or clamped in a vise when not being used as a portable tool.

Wallace Supplies Mfg. Co., 1300 Diversey Pkwy., Chicago 14.

■

Heavy-Duty Etcher for Toolroom Use

This etcher should find many uses in toolrooms. Its wide range of heats make it suitable for marking small and large tools and pieces of equipment.

Six heats give from 180 to 1375 watts. All taps are taken from the secondary windings, the primary always remaining in the circuit. This eliminates the danger of overheating when the etcher is left connected, manufacturer says.

Comes complete with storage case for all cables and parts.

The Martindale Electric Co., 1393 Hird Ave., Cleveland 7.

■

Mountable Handtool

An electric, mountable handtool driven by a 1/5-hp. motor has spindle speeds from 15,000 to 45,000 rpm. It is air-cooled and free from vibrations, maker says.

The motor is protected against overload and two automatic brush stops cut off power when brushes need replacement.

Tool has aluminum alloy housing.

Precise Products Corp., 1328 Clark St., Racine, Wis.

■

For Constant, Uniform Oil Film Lubrication

Oil-Air is a fully automatic lubrication system for bearings, vees, slides, ways, rollers, cams, chains, gears, and transmissions.

Employing no moving parts, it applies a constant, uniform oil film. Microscopic oil particles are carried by a compressed air stream and distributed through tubing to the bearings or other parts.

J. N. Fauver Co., Inc., 51 W. Hancock, Detroit 1.

Turn the page

P&H ELECTRIC HOISTS
Imagine!
A P&H
ZIP-LIFT
AT THIS
NEW
LOW PRICE
ONLY
$19950
A real wire rope hoist!
Of course you prefer the Zip-Lift! With all its quality features, who wouldn't! But if higher cost has stopped you, here's good news. It is now available with improved rope control (one pendant, not two), for simple, easy, trouble-free operation — for only $199.50. It is the same Zip-Lift in other respects — same quality — new type control. What a buy!
Call your Zip-Lift Dealer
Or write us for Bulletin H-29
Available also with full electric push-button control.
Other models up to 15-tons capacity
P&H ELECTRIC HOIST DIVISION
HARNISCHFEGER
CORPORATION
Milwaukee 46, Wis.

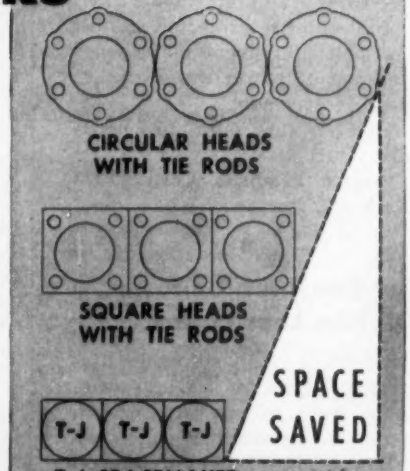
LESS SPACE!

extra high safety factor!

NEW T-J Spacemaker AIR CYLINDERS

These new T-J Cylinders *save up to 40% in mounting space*—with streamlined design that eliminates tie rods. They're *super rugged*—extra high safety factor . . . solid steel heads . . . heavy wall, precision honed, hard chrome plated, seamless steel body . . . leakproof cylinder head to body construction . . . heavy duty, hi-tensile, hard chrome plated piston rod.

Available with the new T-J Super Cushion Flexible Seals which insure positive cushion with automatic valve action for fast return stroke. Many standard sizes and styles . . . for pushing, pulling, lifting, clamping or control jobs. T-J dependability. Write for bulletin 8152. The Tomkins-Johnson Co., Jackson, Mich.



T-J SPACEMAKER . . . provides additional room for adjacent equipment without sacrificing strength.

27 YEARS EXPERIENCE

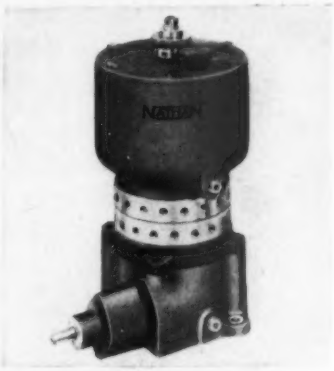
T-J TOMKINS-JOHNSON

RIVITORS AIR AND HYDRAULIC CYLINDERS CUTTERS CLINCHORS

4 Weeks Delivery on the Spacemaker—any style, any stroke, 1" to 3" diam.

NEW MAINTENANCE TOOLS & SUPPLIES

Begins on page 185



Multi-Point Service Lubrication System

Here's an automatic lubrication system that will deliver lubricant to as many as 36 individual points, regardless of pressure differences. Called Lo-Flo.

Flow rate per feed ranges from 2.3 cubic inches per hour to less than 1 cubic inch per 700 hours. Can use lubricants from light oils to light greases.

Available with a number of drives. Unit has self-lubricated construction and is self-priming, maker says.

Nathan Manufacturing Corp., 416 E. 106 St., New York 29.

■

Non-Toxic Silver Soldering Flux

A non-toxic silver soldering flux that works equally well at the highest or lowest melting points in brazing operations has been marketed.

Can be used for brazing, hard soldering or silver soldering. Absence of hydrofluoric acid accounts for its non-toxic properties.

The flux is soluble in water, will not harden or crystallize in the jar, and will not pit the solder, the maker says.

Superior Flux & Manufacturing Co., 1302 Ontario St., Cleveland.

Turn the page

HALL INDUSTRIAL WATER REPORT

Hall Laboratories, Inc.—A Subsidiary of Hagan Corporation, Pittsburgh, Pa.

Volume 1 | OCTOBER 1953 | Number 5

Expert Knowledge Solves Process Problems

A hurry-up call from a Hall field engineer sent C. T. Roland, Pittsburgh headquarters expert on metal preparation and paint finishing to confer with a west coast automobile plant on a paint blistering problem. The sudden occurrence of the blistering baffled the plant engineers until Roland investigated the possibility of a change in the source of the water used in final rinsing of the metal before paint was applied. He found that the quality of the water supply had changed shortly before the blistering developed. Analysis showed that this supply was higher in pH and dissolved solids, particularly sodium chloride, than the water previously used. Mr. Roland's experience in dealing with the action of soluble salts under paint films led to the conclusion that in this case the paint was acting as a semi-permeable membrane, allowing the passage of moisture from the outside surface of the paint to the salty underlayers. Blisters formed wherever the osmotic pressure of the salt solution exceeded the bond of the paint to the metal. The higher alkalinity of the water contributed to the loss of adhesion, promoting further separation of the finish from the metal.

With the cause for the trouble established, recommendations were made to obtain a water supply low in solids until the plant could install equipment to insure the constant delivery of water of suitable quality for this operation.

In another case where specialized knowledge was useful, Ralph Thompson, specialist on paper manufacturing processes, was called in to help a paper mill out of a jam. Their calender rolls, the polished steel rolls that "iron" paper smooth, were corroding. Regrinding to polish the rolls was costly.

Mr. Thompson's on-the-spot investigation revealed that too much alum was being used in the sizing. Alum feed was reduced and the process water was treated with a glassy phosphate corrosion inhibitor. When reliable controls of the modified process were set up, corrosion disappeared.

Water Well Capacity Increased by Treatment With Glassy Phosphate

Initial capacity of new municipal well was recently increased 63% by treatment with Calgon.* Other new wells in the field developed capacity increases up to 34%. In an old well where the capacity had fallen to only 9.5 gallons per minute per foot of drawdown, one charge of Calgon raised the capacity to 31.2 gallons per minute per foot of drawdown, an increase of 228%.

In another case, after acid cleaning had restored a municipal well to approximately the same capacity it had when new, a single charge of Calgon raised the capacity by 100%, or about twice the original capacity of the well.

The dispersive action of glassy phosphate is responsible for its efficiency as a well cleaner. Cleaning with inhibited acid removes deposits of calcium carbonate and iron oxide, but will not affect accumulations of clay, quartz, amorphous silica, mica or silt. These latter are also dispersed and removed by Calgon cleaning.

Hall Is Water Consultant For Asia's Greatest Power Station

India's $35 million power plant, 200 miles north of Calcutta in the Damodar Valley, began operation in February. This is part of an extensive project to hasten the industrial development of a ¼-million square mile area of India.

Alex Henricks, staff engineer serving as consultant for India's new power plant, lifts water sample from container marked "This Package Opened and Examined by Customs at Calcutta."

Engineers and constructors of the station, The Kuljian Engineering Corporation of Philadelphia, have retained Hall Laboratories, Inc. as water consultants.

Industrial Water Problems Require Special Handling

There are no "stock answers" to industrial water problems. For information, write, wire or call Hall Laboratories, Inc., Hagan Building, Pittsburgh 30, Pa.

Water is your industry's most important raw material. Don't waste it.

*Calgon is a registered trademark.

MEMO
TO J.B.S. Plant Supt.
Let's check the Ransburg spray painting processes to see what they can do for our paint line... Their story sure sounds good.
E. M.

Yes, the Ransburg story of cutting painting costs to a fraction of the cost of other methods does sound good. It *is* good!

On most factory production lines, the Ransburg electro-coating processes will provide 2 to 4 times more parts per gallon of paint—automatically—with one operator doing the work of many.

That's because the Ransburg No. 2 Process is the most efficient spray coating process ever developed for industry's use.

If you are a manufacturer of painted products, and if your work volume warrants conveyorized painting, we'd like to tell you more about the production efficiency of the RANSBURG No. 2 PROCESS as it applies to YOUR production. Too, we'd like to show you typical examples of customers' production lines where the Ransburg No. 2 Process is setting new quality standards . . . increasing production . . . and at the same time, saving manpower, money and materials.

Write for literature, or send for "Miracles In Painting" —our new 16mm. sound and color movie which shows on-the-job examples of Ransburg Processes at work in industrial plants all over the nation.

RANSBURG

Ransburg ELECTRO-COATING CORP.

INDIANAPOLIS 7, INDIANA

NEW MAINTENANCE TOOLS & SUPPLIES

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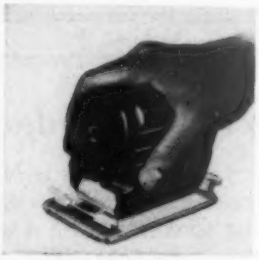


Light and Compact Sander-Polisher

Designed for straight line action, this light and compact electric sander-polisher delivers 240 strokes per second with the grain of the wood.

Its design provides a secure hand grip, close to the work for better control. Its straight line action is free from bucking and whipping, manufacturer says.

Has a snap-lock, self-tightening sandpaper gripper. Pad travel is 3/32 inch while idling and ⅛ inch under load. Working weight is 2½ pounds.

Wen Products, Inc., 5808 Northwest Highway, Chicago 31.

■

Tool Costs Cut by Adjustable Drill

Here's an adjustable drill with high speed steel blades for tool room or repair shop. Eliminates need for a complete set of drills where only an occasional hole must be drilled.

Slower rate of stock removal is compensated for by lower tool investment. Has one set of blades to cut holes from 2 to 3 inches and another set for holes from 3 to 4 inches.

Drill body is made of a heat-treated steel alloy for long life, maker says.

Hayden Twist Drill Co., 8626 Lyndon Ave., Detroit 38.

Turn the page

ALEMITE OIL-MIST

saves Hoover $3670 in 15 months!

eliminates bearing failures... slashes maintenance costs!

The Hoover Company, the world's oldest and largest manufacturer of electric cleaners, recently faced a rash of costly repairs on key machines in their North Canton, Ohio plant. Replacement parts and labor ran excessively high . . . down-time mounted . . . production schedules lagged.

To help solve these problems *quickly*, an Alemite "Friction Fighting" specialist was called in to work with plant engineers. After careful study and analysis, Alemite Oil-Mist Systems were recommended and installed.

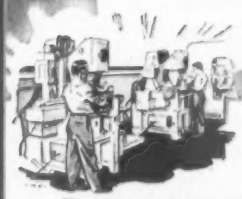
Results were astounding!

Universal joints on a drilling machine, *formerly replaced every 10 days*, have been giving trouble-free service for 15 months! . . . Savings—$2250!

Maintenance costs due to overheating on another high speed machine—*ended!* . . . $900 saved!

Bearings, previously replaced every 4 months on a polishing machine, *are still on the job after 10 months* . . . Again, a saving—$520!

Parts spoilage drastically cut! Oil traces, as revealed under black light inspection, *eliminated!*



Facts prove this *"Friction Fighter"* most efficient, continuous, fully automatic lubrication system

Industry everywhere relies on Alemite—the world leader in lubrication methods. Oil-Mist, one of Alemite's greatest developments, is the system that *atomizes* oil into mist—distributes it through tubing to bearings—bathes all surfaces with a cool film of clean oil. A miracle of efficiency, Oil-Mist has no moving parts—eliminates the human element. Proved *on the job* in numerous applications throughout industry, Oil-Mist uniformly maintains oil film on plain and anti-friction bearings, gears and chains—despite variations in load, temperature or speed. Why not get the facts on Alemite Oil-Mist—*today?*

ALEMITE OIL-MIST Lubricates All Types of Mechanisms

Alemite OIL-MIST Lubrication

A PRODUCT OF SW STEWART-WARNER

Compare all these OIL-MIST advantages with *ordinary* methods!

- Reduces bearing temperatures as much as 20%.
- Continuous, uniform lubrication of all types of bearings.
- Air pressure seals bearings against dirt.
- Reduces oil consumption—up to 90%.
- Prevents product spoilage.
- Eliminates guesswork—each bearing picks up as much Oil-Mist as it needs.
- Reduces starting and running torque.

Get the facts NOW!

Alemite, Division of Stewart-Warner, Dept. G-103
1850 Diversey Parkway, Chicago 14, Illinois

☐ Please send me a FREE copy of your new and complete OIL-MIST catalog.

☐ Please have your Alemite Lubrication Representative arrange a desk-top demonstration of OIL-MIST. This entails no cost or obligation on my part.

My name .....

Title .....

Company .....

Street .....

City ..... State .....

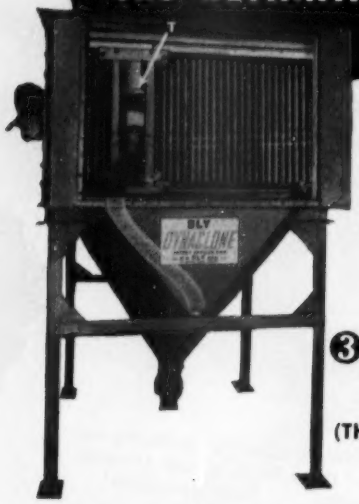
NOW!

THE

DYNACLONE®

PATENTED

The ULTIMATE in Dust Filters



❶ CONSTANT SUCTION
AT DUST SOURCES

❷ SELF CLEANING
FOR CONTINUOUS OPERATION

❸ NO AUXILIARY MOTORS OR BLOWERS
(THE MAIN OPERATING FAN DOES THE CLEANING)

❹ NO ABRASION OF BAGS BY THE CLEANER

The traveler (T) is open to atmosphere by means of a 4-inch flexible hose. As the traveler contacts the open end of each bag, the negative pressure which exists in the dust chamber draws a blast of air (from the atmosphere) through the bag to thoroughly clean it.

Each bag is cleaned, on an average, once every five minutes, thereby assuring uniform suction at dust sources.

The Dynaclone has now been in operation in many different industries for the past three years. More than half of present orders are from the same customers.

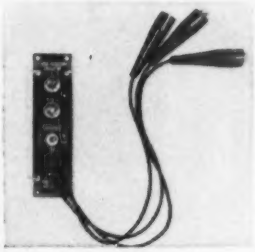
SEND FOR BULLETIN . . . NO. 102

THE W. W. SLY MFG. COMPANY
4755 TRAIN AVENUE • CLEVELAND 2, OHIO
New York • Chicago • Philadelphia • Syracuse •
Detroit • Buffalo • Cincinnati • St. Louis •
Minneapolis • Birmingham • Los Angeles • Toronto

SLY PIONEERS & LEADERS in INDUSTRIAL DUST CONTROL

NEW MAINTENANCE TOOLS & SUPPLIES

Begins on page 185



Compact Phase Sequence Indicator

A simple and compact phase sequence indicator to save time for electricians, maintenance men, and engineers has been marketed.

Has no moving parts and is easy to operate. Can determine polyphase motor rotation, transformer and alternator connections, or any other phase sequence information desired.

Can be used in 110-, 220-, or 440-volt lines without modification of use of external resistors.

United Manufacturing Co., Hamden, Conn.

■

Heavily Reinforced Slitting-Saw Blades

The heavily reinforced bodies of these slitting-saw blades are designed to prevent shearing and shattering at high operating speeds.

The blade's body, built to the width of the teeth, also minimizes vibrations. The saws are color coded for identification by an electroplating process which also prevents rust.

The Nelco Tool Co., Manchester, Conn.

■

Force-Feed Lubricators

Two high-pressure force-feed lubricators designed for service up to 30,000 pounds have been marketed.

The units have four sight-feed and pump assemblies mounted on

Blue Monday!

A washer's a "washout" without fasteners. But luckily for the housewives of America this catastrophe can never happen.

For Lamson & Sessions has long worked hand in glove with the appliance people to develop dependable engineered fasteners for home appliances.

If you, too, want to be *sure* of the "just right" fasteners for your product, check with Lamson during the planning stage. Our engineers will be happy to help you with your selection and possibly suggest fasteners that will save time and money on the assembly operation.

Remember, no matter what your fastener requirements, it's always *pleasant* and *profitable* to do business with Lamson & Sessions.

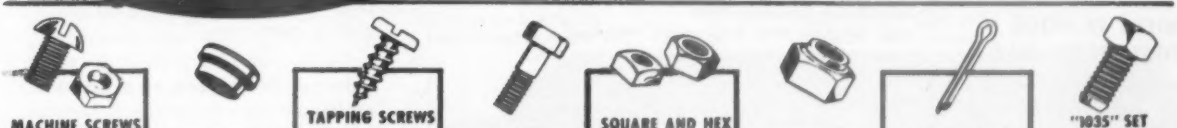
TAPPING SCREWS For Fast Sheet-Metal Fastening

Self-tapping screws require no nuts, no tapped holes. Therefore, they are important time-savers on all sheet metal assembly work. A choice of type "A", "B" and "C" threads. Heads available with slotted or Phillips driver recesses.

Lamson & Sessions

The LAMSON & SESSIONS Co.
1971 West 85th St. • Cleveland 2, Ohio
Plants at Cleveland and Kent, Ohio • Birmingham • Chicago

FOR PROMPT DELIVERY AND HELPFUL SERVICE, ORDER FROM YOUR LAMSON DISTRIBUTOR



MACHINE SCREWS AND NUTS — Precision made for fast, economical assembly.

PLUG NUTS — Ideal for blind or hard-to-reach places.

TAPPING SCREWS — Choice of round, pan, truss, flat oval, hexagon and Phillips heads.

CAP SCREWS — Bright and "1035" Hi-Tensile Heat-treated steel.

SQUARE AND HEX NUTS — Semi-finished, hot pressed, cold forged.

LOCK NUTS — Economical, vibration proof. Can be used repeatedly.

COTTER PINS — Steel, brass, aluminum and stainless steel.

"1035" SET SCREWS — Cup point type, hardened and heat-treated.

Every shift, a roomful of waste dust is gathered by the Pangborn Dust Collector shown above, compressed into 5 bales of 450 lbs. each (like one at left), and sold.

Pangborn Dust Control traps over 2000 lbs. of dust a day

at Personal Products Corp.

Processing tissue and cotton items at Personal Products Corp., Chicago, Ill., frees great quantities of fibrous dust. To control this dust, a Pangborn Dust Control system at Personal Products filters 35,000 cu. ft. of air a minute.

Every shift, Pangborn equipment collects over 2000 pounds of dust which Personal Products bales and sells to paper mills and similar industries. During the winter, the already-warmed, cleaned air is reused, cutting fuel costs and eliminating need for additional heating equipment. And the dust-free atmosphere maintains working conditions at a high level.

Robert MontBlanc, Salvage Foreman at Personal Products, says: "The Pangborn Dust Collector is doing a good job. It improves working conditions, makes plant housekeeping less costly, saves money on heating costs, and gathers salable salvage material. The last factor alone makes Pangborn very much worth-while."

Look to Pangborn for the latest developments in Dust Control and Blast Cleaning equipment

Pangborn DUST CONTROL

STOPS THE DUST HOG from stealing profits

WHAT IS YOUR DUST PROBLEM?

Whatever aspect of dust control bothers you, Pangborn will solve your problem. Mail coupon today for complete information.

PANGBORN CORPORATION,
2100 Pangborn Blvd., Hagerstown, Maryland
Gentlemen: Please send me a copy of Bulletin 909A.

Name .....

Company .....

Address .....

City ..... Zone ..... State .....

a cast iron reservoir. Pumps can be removed without disassembling the lubricator. Fingertip adjustment controls sumping rate, maker says.

The HP20 model pumps 6½ drops of SAE 40 oil per stroke against 20,000 psig., while the HP30 made pumps 4 drops against 30,000 psig.

Frontier Industries, Inc., Buffalo, N. Y.

■

Adjustable Wrench With Locking Jaws

The Utica No. 92 Locking Wrench operates like an ordinary adjustable wrench. But the jaws can be locked rigid at any setting, the maker adds.

It can also act like a vise-wrench, exerting up to a 100-lb. grip on the bolt or machine component to which it is fastened, maker claims.

A lever operating on the knurl controls jaw locking and unlocking. Even dropping the wrench or hitting it won't loosen the lock.

Being made in 8-, 10-, and 12-in. sizes of alloy steel with extra-hardened jaws.

Utica Drop Forge & Tool Co., Utica, N. Y.

■

Air-Operated Screw Drivers, Nut Setters

Twenty-four lightweight, air-operated, reversible screw drivers and nut setters have been marketed.

These tools, for service and repair work, can remove and apply threaded fasteners because of their reversing action. Come in four basic speeds ranging from 475 to 2000 rpm.

Tools can be obtained with either a slip clutch or a positive clutch.

Thor Power Tool Co., Aurora, Ill.

Turn the page

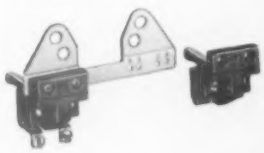
EXTRA AUXILIARY CONTACTS

for ALL Allen-Bradley Starters . . . Sizes 0 to 7

Auxiliary Contacts—Sizes 0 & 1

NOW . . . it's easy to add auxiliary contacts to A-B solenoid starters to operate extra relays, pilot lights, or other accessories. Just follow the steps shown below.

Bulletin 895 auxiliary contacts come in forms to fit all sizes of starters . . . with either single pole normally open, normally closed, or normally open-normally closed contacts. They can be added to any A-B starter in stock or in service.



Auxiliary Contacts—Sizes 2 & 3

ADD ONE OR TWO AUXILIARY CONTACTS TO ANY A-B SOLENOID STARTER

Bulletin 709 Size 0 starter with auxiliary lock-in contact

Bulletin 709 Size 0 starter with one extra auxiliary contact

Bulletin 709 Size 0 starter with two extra auxiliary contacts

SIZE 0 STARTER

One or two extra auxiliary contacts can be mounted on Size 0 arc hood. Terminals are easily accessible from front. Rugged—simple—trouble free.

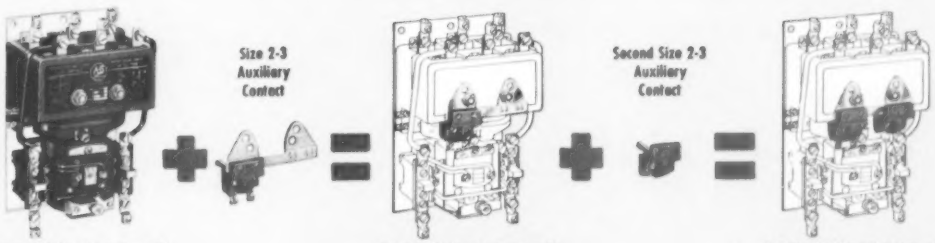
Bulletin 709 Size 1 starter with auxiliary lock-in contact

Bulletin 709 Size 1 starter with one extra auxiliary contact

Bulletin 709 Size 1 starter with two extra auxiliary contacts

SIZE 1 STARTER

One or two extra auxiliary contacts can be mounted on Size 1 arc hood. Terminals are accessible from front. Existing wiring not disturbed in any way.



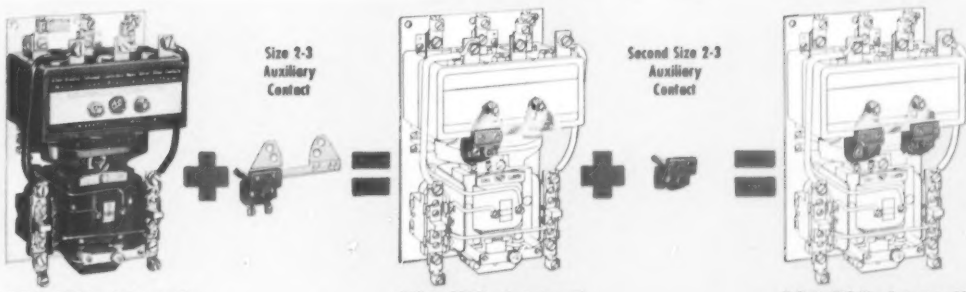
Bulletin 709 Size 2 starter with auxiliary lock-in contact

Bulletin 709 Size 2 starter with one extra auxiliary contact

Bulletin 709 Size 2 starter with two extra auxiliary contacts

SIZE 2 STARTER

Mounting plate will hold one or two extra Size 2-3 auxiliary contacts. It is attached to starter using existing arc hood threaded studs and lock nuts. Solenoid plunger of starter actuates the auxiliary contacts.



Bulletin 709 Size 3 starter with auxiliary lock-in contact

Bulletin 709 Size 3 starter with one extra auxiliary contact

Bulletin 709 Size 3 starter with two extra auxiliary contacts

SIZE 3 STARTER

The Size 2-3 mounting plate will also fit the Size 3 arc hood and support one or two auxiliary contacts. Easy to install and simple to operate. Trouble free performance is guaranteed. No contact maintenance.

Contact arrangements are readily changed from normally open to normally closed, or vice versa. This flexibility opens new possibilities for applying Allen-Bradley contactors and starters to automatically controlled equipment.

Allen-Bradley Co.
1316 S. Second St., Milwaukee 4, Wis.

ALLEN-BRADLEY
MOTOR CONTROL

8-53-MR

MAKE YOUR OWN TERMINAL STRIPS

with these handy

BULLETIN 892 TERMINAL BLOCKS

EASILY MADE UP IN ANY LENGTH TO MEET YOUR TERMINAL STRIP SPECIFICATIONS

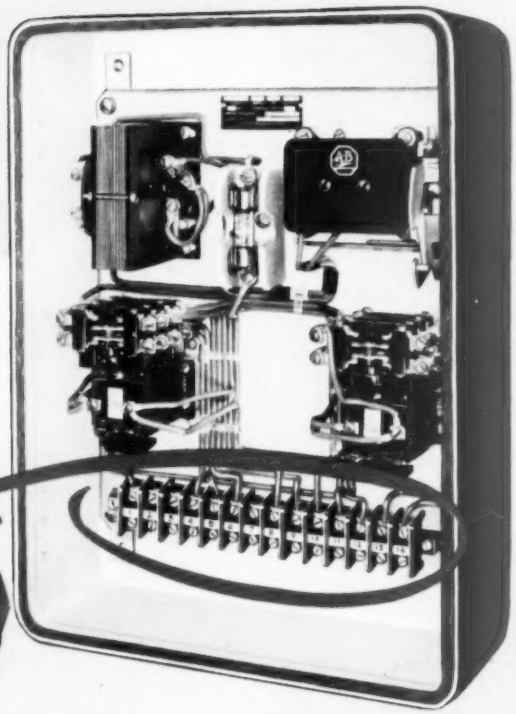
Bulletin 892 terminal blocks interlock in perfect alignment to provide the exact number of terminals for any panel board. There are no excess terminals—hence, no waste of panel space. The required terminal strip can be assembled quickly and mounted on the panel with hold-down bolts. Plastic barriers separate the clamp-type terminals which have lock washers.

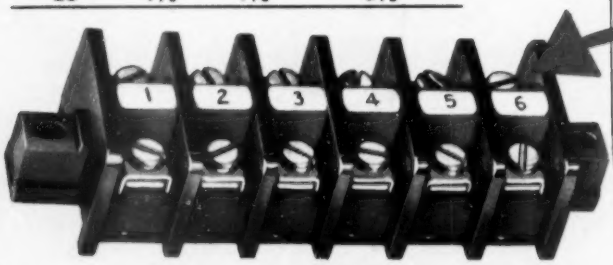
One end block and any number of terminal blocks may be hooked together. In general, every 13th block is used to secure a long terminal strip to the panel.

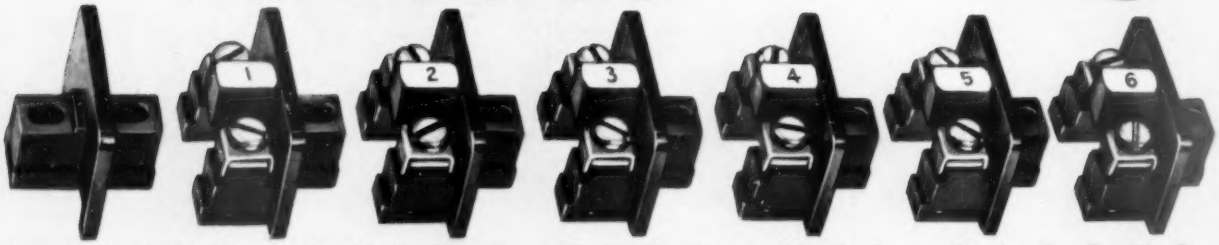
AVAILABLE IN TWO CURRENT RATINGS
15 AMPERES—25 AMPERES

Dimensions of Bulletin 892 Terminal Blocks

Ampere Rating	Width	Height	Over-all Length of 10 Blocks
15	1½"	1"	7"
25	1⅞"	1⅛"	8⅛"







INTERLOCKING TERMINAL BLOCKS

ALLEN-BRADLEY QUALITY MOTOR CONTROL

A-B Quality

Allen-Bradley Co.
1316 S. Second St., Milwaukee 4, Wis.

8-53-MR

NEW MAINTENANCE TOOLS & SUPPLIES

Begins on page 185

Tool Deburs and Chamfers Both Faces

Deburring and chamfering of both front and back faces of holes in metal sheet and plate from one side can be done by this tool. It is called the Noburmatic Tool.

Suitable for use in portable drill motors and in stationary machine tools. Independent controls set working depth of the front and rear cutters.

Nobur Manufacturing Co., 717 N. Victory Blvd., Burbank, Calif.

■

Powder Lance Pierces Difficult Surfaces

Oxweld ACL-1 Powder Lance, automatically mixing oxygen and powder in the correct proportions, pierces holes in many materials that resist a standard oxygen lance.

Oxygen and powder have single lever control. Standard lance pipe in single or multiple lengths can be used. Three interchangeable holders are available to fit ¼-, ⅜-, and ½-in. pipe.

Linde Air Products Co., 30 E. 42nd St., New York 17.

■

POWER BUFFING TOOL for use with most any electric drill has been marketed by the Magic Chemical Co., 121 Crescent St., Brockton 2, Mass. Called Magic Buffer, it will give a rough or matted finish to iron, steel, fabrics, leather, wood, and concrete, maker claims.

■

CARBIDE-TIPPED SAW BLADES designed for use with radial saws have been marketed by the Rockwell Manufacturing Co., 400 N. Lexington Ave., Pittsburgh 8. The blades will eliminate many blade problems in industrial cutting operations and reduce machine downtime, the manufacturer says.

Turn the page

New HEAVY-DUTY TENNANT MACHINES HELP YOU SAVE 35% to 80% in FLOOR CLEANING COSTS!

These new machines are typically TENNANT—designed for tough round-the-clock jobs . . . built to save you 35% to 80% in cleaning costs. And they're engineered for extra *years of service.*

You'll like their new power, speed and convenience—for pulverizing grease-caked grime . . . power sweeping . . . high speed dry-cleaning . . . and many special uses. Gas, electric or battery-powered; 8" to 48".

WRITE TODAY for details. We'll gladly estimate your plant's savings.

MODEL R SCARIFIER for cleaning grease-caked aisles. Moves with traffic. Faster than 6 to 18-man crew! Cleans 36" path; dumps hydraulically.

MODEL 75 SWEEPER—New! Pays for itself in about 1 to 6 months. Sweeps 100,000 sq. ft. per hour. Has instant reverse; dumps in 30 seconds.

MODEL K MACHINE—A proved time-saver. Cleans 16" path. Pulverizes and picks up in 1 operation; leaves clean, fast-trucking surface. Has many uses. Gas or electric models, to 7.3 hp.

MODEL 24 SWEEPER—The low-cost sweeper with big sweeper capacity. Cleans 24" to 36" path (with sidebrush); speeds 2 to 8 mph. Efficient brush and vacuum system, automatic clutch.

Get your FREE COPY of these helpful bulletins

HOW MUCH CAN YOU SAVE?
Ask for engineering data on savings possible in your plant.

G. H. TENNANT CO.
2554 No. 2nd Street
Minneapolis 11, Minn.

G. H. TENNANT COMPANY
Minneapolis 11, Minnesota

Please send bulletins and details on—

- ☐ Model R Scarifier
- ☐ Model 75 Power Sweeper
- ☐ Model K Floor Machine
- ☐ Model 24 Power Sweeper
- ☐ Asphalt tile maintenance
- ☐ Hardwood floor maintenance

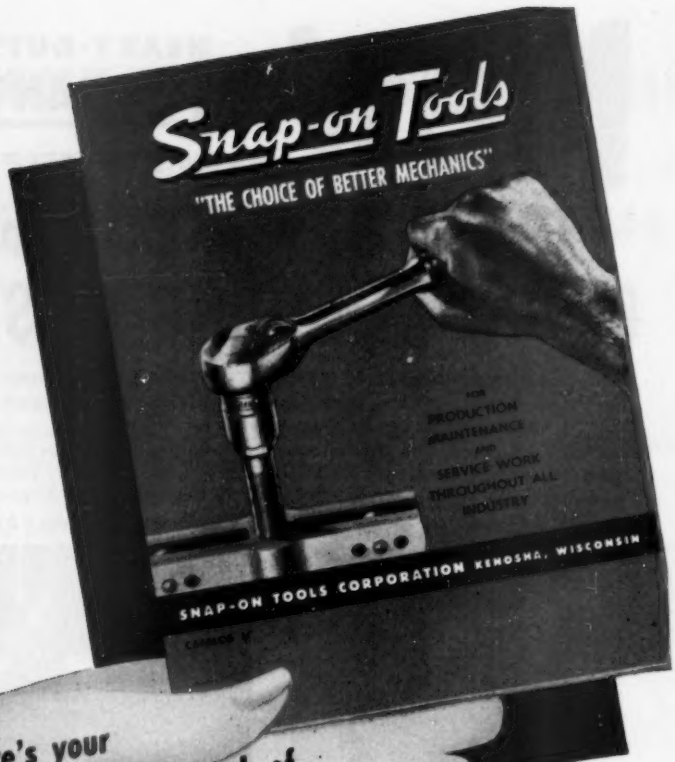
NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

TENNANT Established 1870

INDUSTRIAL FLOOR MACHINES


Snap-on Tools
"THE CHOICE OF BETTER MECHANICS"
FOR PRODUCTION MAINTENANCE AND SERVICE WORK THROUGHOUT ALL INDUSTRY
SNAP-ON TOOLS CORPORATION KENOSHA, WISCONSIN

Here's your handy reference book of 4,000 time-saving tools for production and maintenance

NEW Snap-on* CATALOG

WRITE FOR YOUR COPY TODAY!

You'll want this latest 104-page edition of the most complete, most informative tool catalog published! This catalog lists all sizes and types of wrenches from largest needed on heavy machines to small ones for use on delicate instruments. Special tool equipment for fast repair of diesel and other engines. Includes new tools engineered by Snap-on to help handle difficult jobs with greater speed and safety. Write for your copy today.

SNAP-ON TOOLS CORPORATION
8044-J 28th Avenue, Kenosha, Wis.

*Snap-on is the trademark of Snap-on Tools Corporation.

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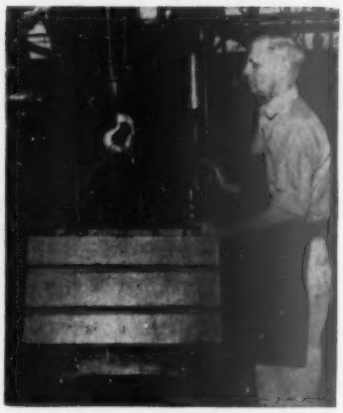
MATERIALS HANDLING



Hook Safety Gate Locks Automatically

This safety gate for hoist and crane hooks locks automatically, will not open unless the pin is manually depressed. Makes it impossible for load to slip off hook, the manufacturer says.

The gate uses the hook shank as a base but doesn't block hook's throat.

E. D. Bullard Co., 275 Eighth St., San Francsico 3.

■

Two 7500-lb. Capacity Fork Trucks Announced

Two fork trucks with 7500-lb. capacities at a 24-in. load center from face of the forks have been introduced.

Available in standard lift heights from 72 to 114 inches. Model FT75-24 is powered by a gasoline engine while Model FTD75-24 is powered by a diesel.

Side panels are removable for easy access to parts. Can be equipped with cushioned or solid rubber tires.

Buda Co., Harvey, Ill.

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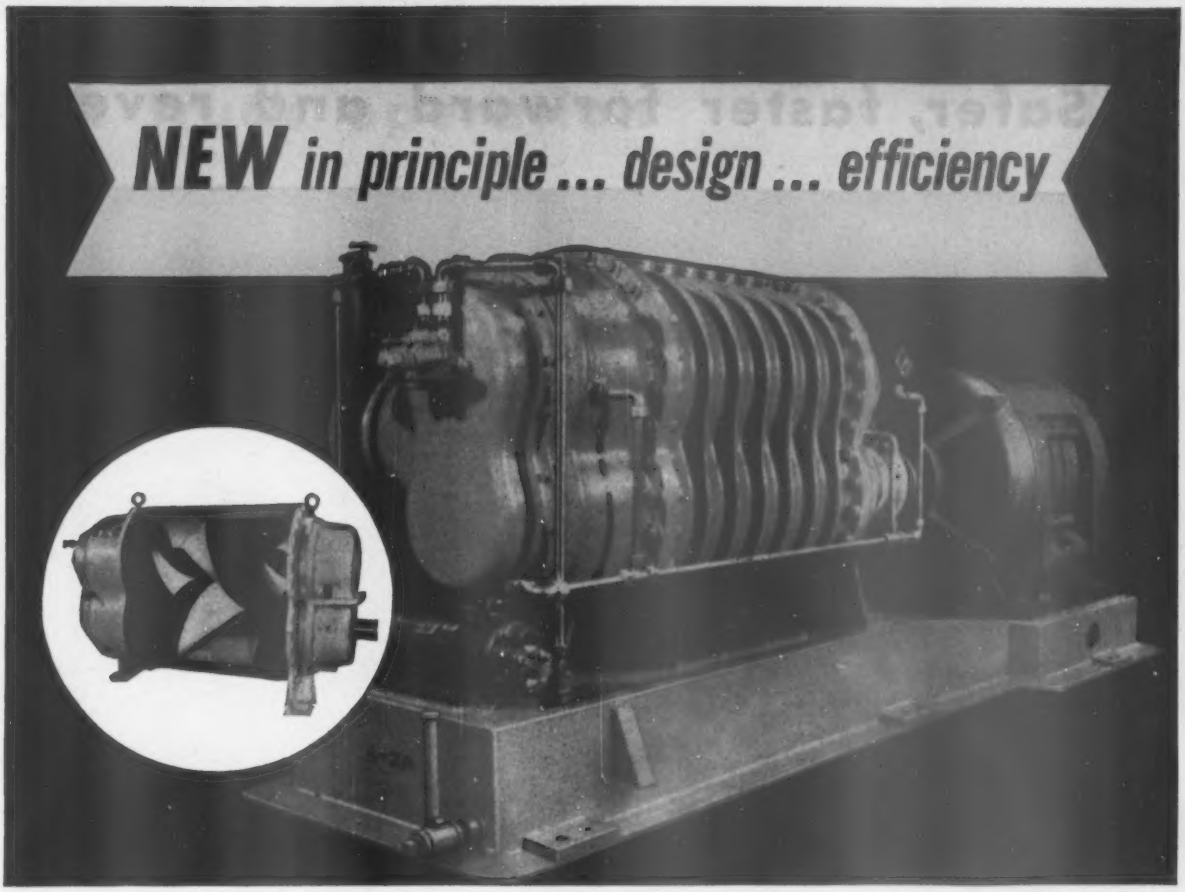


ROOTS-CONNERSVILLE SPIRAXIAL COMPRESSORS

To its widely accepted *dual-ability* line of Rotary Positive and Centrifugal equipment for handling gas and air, Roots-Connersville announces the new SPIRAXIAL Compressors. Based upon the long-proved rotary blower, originally conceived by the Roots Brothers in 1854, but entirely new in operating principles, the SPIRAXIAL design offers several outstanding advantages over present types of compressors, within its range of use:

1. Peak efficiencies at discharge pressure determined by requirements.
2. No internal lubrication used or needed.
3. Minimum of servicing, with wearing parts quickly accessible.
4. Low noise level—smooth operation.
5. Light weight.

In operation, two "spirotors" revolve in opposite directions, and cause internal compression of the air or gas. This principle of internal compression leads to higher efficiencies, which begin to be pronounced at about 10 psi and are more pronounced at higher pressures, with internal compression performance up to at least a 3 to 1 ratio.

These new SPIRAXIAL Compressors increase the flexibility of the Roots-Connersville line and offer possibilities for economy and efficiency which are well worth investigating. We shall gladly study your requirements and make definite recommendations. Descriptive bulletin No. SC-152 on request.

ROOTS-CONNERSVILLE

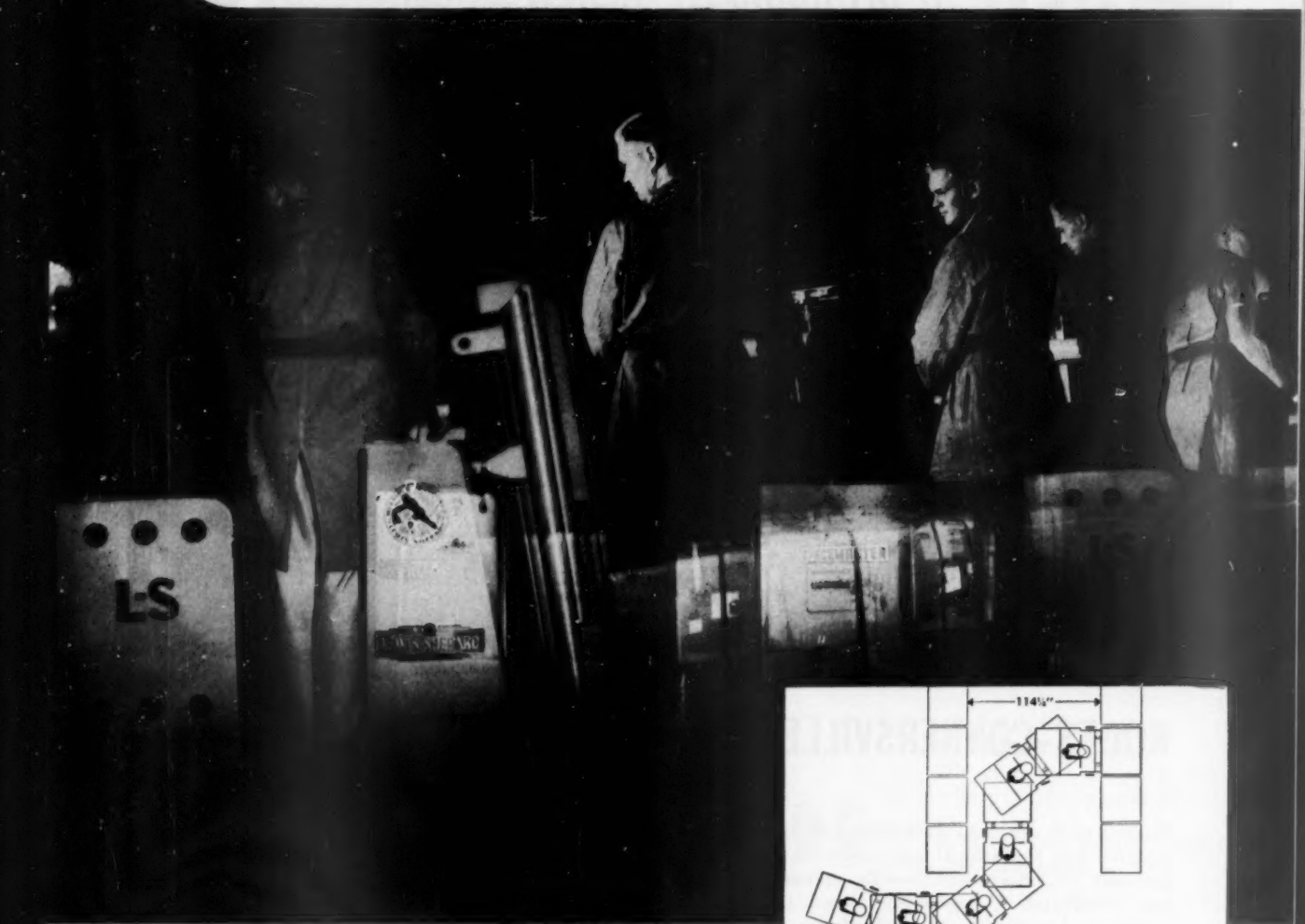
Exclusive Specialists in Handling Gas and Air

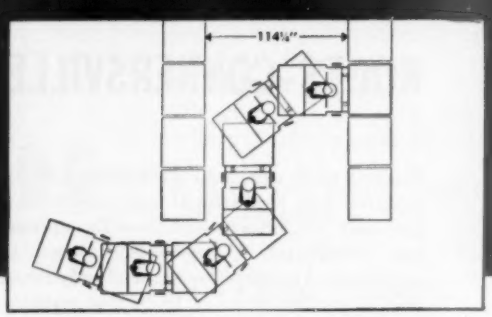
BLOWER BUILDERS SINCE 1854

ROOTS-CONNERSVILLE BLOWER

A DIVISION OF DRESSER INDUSTRIES, INC.
1853 Central Ave. • Connersville, Indiana

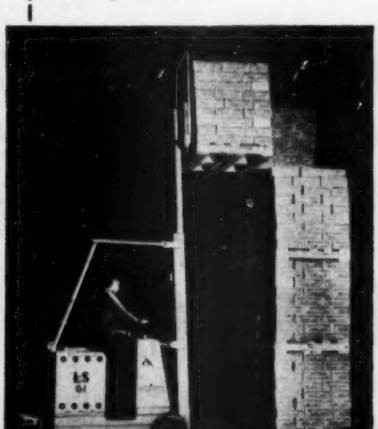
Safer, faster forward and reverse



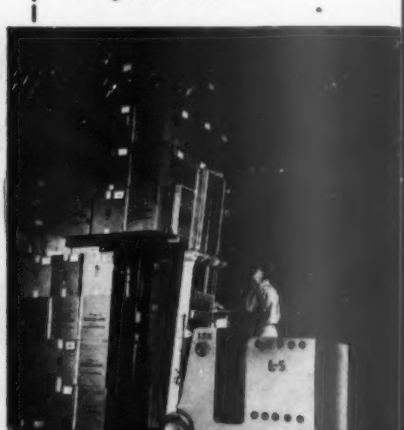


SpaceMaster "59"
Electric Fork Truck
Capacity: 1500 lbs.
Turning Radius: 59"

SpaceMaster "61"
Electric Fork Truck
Capacity: 3000 lbs.
Turning Radius: 61"



SpaceMaster EFTT-4
Electric Fork Truck
Capacity: 4000 lbs.
Turning Radius: 66½"



fork truck operation

with L-S STANDRIVE DESIGN

One of the important advantages of Lewis-Shepard SpaceMaster Electric Trucks is their exclusive "Standrive" design. From his standing position the operator has better visibility for either forward or reverse operation. Trailing a load becomes a safe, fast operation . . . free from the "neck-strain" and blocked vision that operators experience when in a sitting position. Moreover, the SpaceMaster's open corridor with only one single, short step lets your operators enter or leave quickly from *either* side . . . saves time as well as improving visibility.

Compare all these improved features . . . you'll agree, SpaceMaster is your best fork truck investment:

1. **Greater Dependability** — less routine maintenance.
2. **Operates in Less Space** — compact design, smaller turning radius.
3. **Greater Speed** — more powerful traction motor, faster lift motor.
4. **Full Free Lift** — essential where headroom is limited.
5. **Smoother, Timed Acceleration** — with Magnetic Controls.
6. **99% of Foot Braking Eliminated** — with dynamic braking.
7. **No Grease Points** — sealed ball bearings.
8. **Absolutely No Under Truck Adjustments** — all maintenance from topside.
9. **Maximum Stability** — lowest center of gravity.

Here's more proof of Lewis-Shepard Electric Fork Truck dependability

Blue-Chip companies in these industries recently reordered L-S SpaceMaster Fork Trucks:

Paper Mfr.	26 L-S in use — reordered	3
Elec. Gds. Mfg.	41 L-S in use — reordered	13
Grocery Chain	6 L-S in use — reordered	1
Paint Mfr.	1 L-S in use — reordered	6
Motor Transport	1 L-S in use — reordered	12
Auto Mfg.	4 L-S in use — reordered	1
Bottler	2 L-S in use — reordered	5

Make a Visual, Unbiased Comparison

Ask for handy L-S Comparison Charts . . . list the merits of each manufacturer's trucks side-by-side. Lewis-Shepard invites this comparison because we believe our complete line of electric trucks is genuinely superior . . . and when you compare the facts, we think you'll agree.

Write for your Comparison Charts now, or call your local L-S Representative — see "Trucks, Industrial" in your Yellow Phone Book.

The "MASTER" Line

LEWIS-SHEPARD

16-10 Walnut St., Watertown 72, Mass.

Please send

- ☐ Electric Fork Truck Comparison Chart.
- ☐ Proof Folders showing L-S Trucks at work.

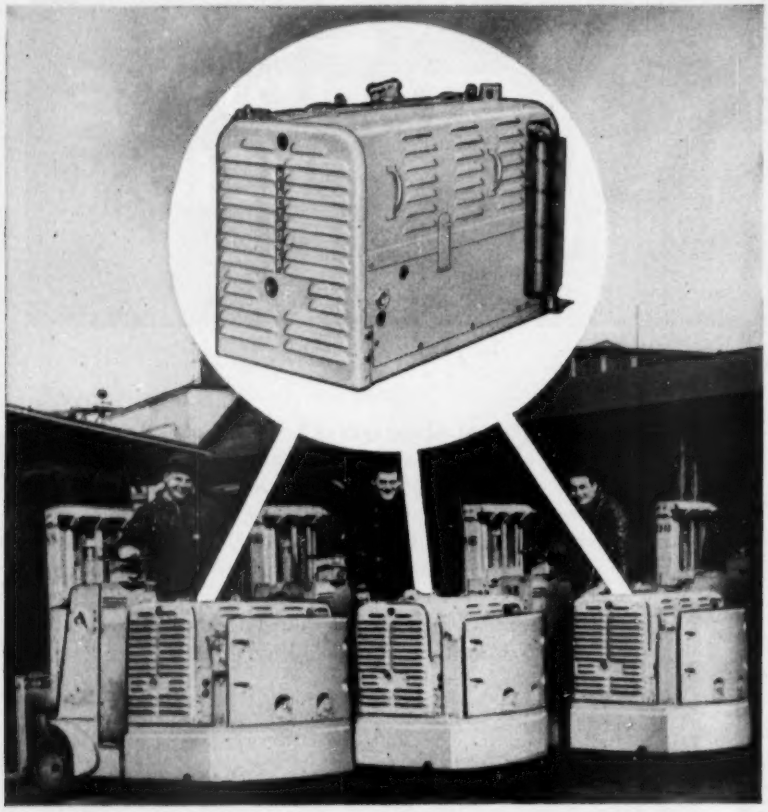
Name .....

Company .....

Street .....

City ..... State .....

Ready-Power is the only Interchangeable gas-electric power unit



Interchangeable Ready-Power units allow the most simplified and economical system of preventive maintenance known, with *no truck downtime!* One spare power unit permits rotation of maintenance operations while trucks stay "on the job" . . . an important reason why Ready-Power automatic electric drive moves materials at lowest cost per ton mile!

AND CONSIDER THESE ADDED FEATURES . . .

- **ONLY READY-POWER has a manufacturing know-how backed by more than a quarter-century of experience in building gas-electric power units.**
- **ONLY READY-POWER offers Diesel-electric power units for electric industrial truck operation.**
- **ONLY READY-POWER has a complete range of sizes in both gas-electric and Diesel-electric power units to meet the requirements of all sizes and types of electric industrial trucks.**

CONTINUOUS-DUTY POWER UNITS

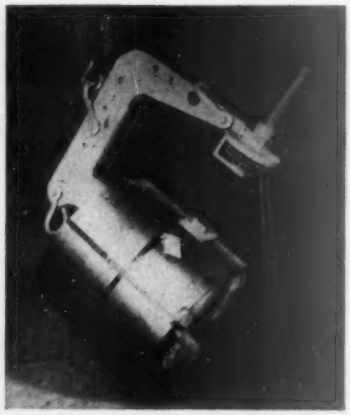
The READY-POWER Co.

3820 Grand River Ave., Detroit 8, Michigan

Manufacturers of Gas and Diesel Engine-Driven Generators and Air Conditioning Units; Gas and Diesel-Electric Power Units for Industrial Trucks

MATERIALS HANDLING EQUIPMENT

Begins on page 194



Coil Handler Has 15,000-lb. Capacity

Here's a handling device for lifting, turning, and transporting large, heavy coils. Capacity is 15,000 pounds.

Will pick up coils set either horizontally or vertically and turn them 90 degrees as the crane lifts. A concave surfaced pressure shoe holds the coil solidly on the inner support arm.

Handles coils from 24- to 48-in. wide and 10- to 16-in. thick.

Dixon Automatic Tool, Inc., 2304 23 Ave., Rockford, Ill.

■

Molded Plastic Elevator Bucket

A self-cleaning, sanitary elevator bucket made of molded plastic has been marketed. It is called Dura-Buket.

Neutral and non-toxic, it is therefore corrosion and rust resistant. Tests have proved under varied and severe conditions that Dura-Buket will out-wear ordinary buckets by a wide margin, manufacturer says.

Safety-wise, the plastic buckets will not hold or generate a static electric charge, or cause a spark when they come in contact with metal.

National Oats Co., East St. Louis, Ill.

Turn the page

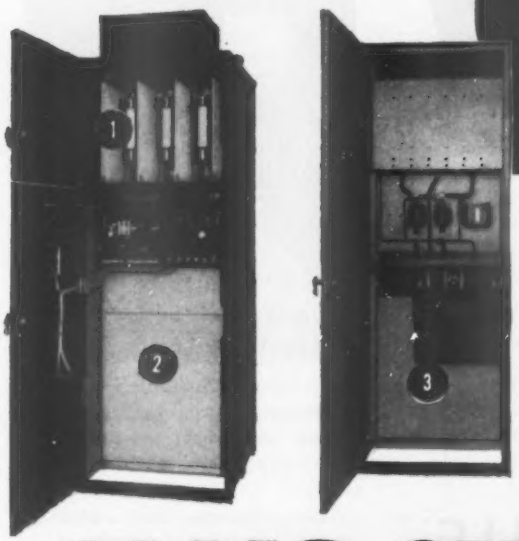
Personnel Protection

THROUGH SEGREGATED HIGH VOLTAGE COMPARTMENTS

For positive personnel protection, high voltages are completely segregated in the Allis-Chalmers Type H starter. Full width, heavy sheet steel barriers separate the front low voltage compartment from the rear high voltage equipment and from the upper fuse compartment. It will pay you to get all the details from your nearby A-C representative or by writing Allis-Chalmers, Milwaukee 1, Wisconsin.

Type H Starters
FOR 2300 TO 5000 VOLT MOTORS

Current limiting fuses are easily removed with hook stick. Safety door interlocks take motor off line when fuse compartment door is opened.



3 Compartments Assure Safety

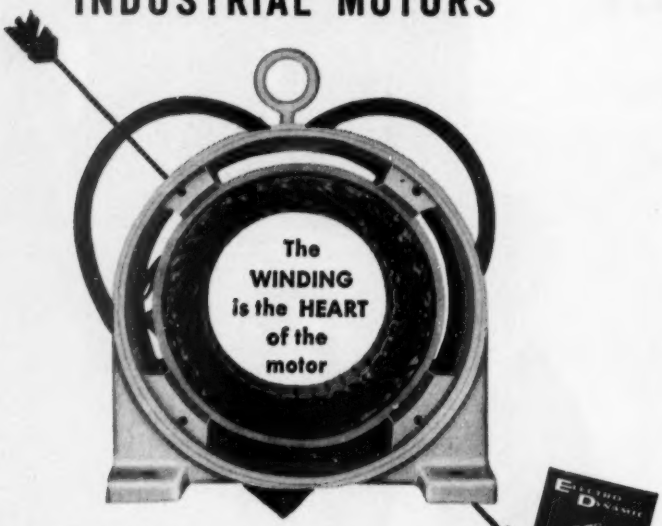
The heavy gauge steel cubicle is divided into three compartments for maximum safety. **1** — Upper front compartment encloses disconnect type fuse. The same operation which puts fuse in position for removal isolates starter from line. **2** — Lower front compartment houses low voltage control devices. **3** — Rear compartment contains high voltage equipment, contactors, buses, instruments, transformers, etc.

A-4002

ALLIS-CHALMERS

ELECTRO *xtra* DYNAMIC *ependable*

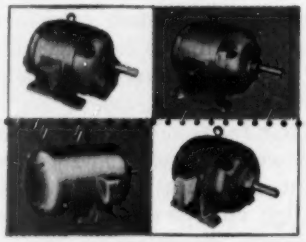
INDUSTRIAL MOTORS



Every Electro Dynamic motor is built with
EXTRA INSULATION in stator slots and between phases
EXTRA IMPREGNATIONS and bakings of the wound stator
EXTRA HIGH-FREQUENCY TESTING of insulation between turns

WRITE TODAY FOR CATALOGUE NO. 1065

From 1 to 250 Horsepower (N. E. M. A. STANDARDS)



One-piece cast iron frames.

Extra large "free-flo" air channels.

Permanently aligned cast iron brackets.

Liberal size grease lubricated bearings.

Also a complete line of Direct Current motors and generators

ELECTRO DYNAMIC
DIVISION OF GENERAL DYNAMICS CORPORATION
BAYONNE, NEW JERSEY

MATERIALS HANDLING EQUIPMENT

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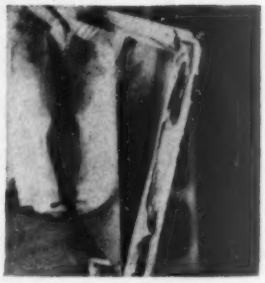


Sheet Metal Handler To Reduce Damage

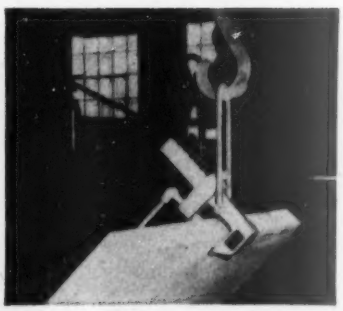
This sheet metal storage device is designed to reduce both materials damage and handling expenses.

Sheet material is stored vertically on the sheet handler. When material is needed, a sheet is simply pulled out from the pile, lifted off, and carried to the job without scratching, gouging, or denting the finish of the next sheet.

Because of the verticle storage, valuable floor space is freed for other uses. Each sheet handler has a capacity of 2500 pounds, yet weighs only 11 pounds.

Western Manufacturing Co., Arkansas City, Kansas.

■



Designed for Safe, Heavy-Duty Lifting

The Gonser Portable Positioner is designed for lifting heavy plates, weldments, castings, and other equipment with complete safety.

This gripping unit combines wedge, screw and toggle. Lifts loads to any desired position and

Order-assembly area at Johnson & Johnson, Chicago. Alternate order-picking aisles are reserved for one-way, two-lane TRUCK-TOW traffic. Fork-lift trucks use other aisles for replenishing stock. Trucks are switched automatically from two-lane traffic to single lane traffic at point A.

Link-Belt TRUCK-TOW helps cut order-assembly manhours 70%!

Johnson & Johnson sets new records for speed, safety, efficiency

BY LIMITING manual carrying of merchandise to less than three feet, eliminating confusing cross-traffic, Johnson & Johnson has achieved spectacular savings in its new Chicago shipping center. With the help of two parallel, integrated Link-Belt TRUCK-TOW Conveyors, they have actually *reduced manhours for order-picking by 70%* . . . for overall shipping operations by 35%.

Two parallel conveyor lines through order-picking aisles permit passing and practically double capacity. One line of trucks may be delegated for "slow" picking without hindering trucks on adjacent lane. Special towing masts permit automatic disengagement of truck to suit position of stock pickers. Hinged safety bumpers automatically disengage trucks when obstructed. Steel enclosures around track, trolleys and chain contribute to plant cleanliness.

Many other plants, warehouses and terminals report that TRUCK-TOW offers welcomed savings—not only for order-picking and shipping operations, but for receiving, department-to-department transport and in and out of storage. Whether you need a simple system or one tailored to suit special conditions . . . whenever packaged or bulky items are moved along a regular route, Link-Belt TRUCK-TOW Conveyors can slash your handling costs.

FLOOR TYPE TRUCK-TOW CONVEYOR OFFERS ADVANCED-DESIGN FEATURES

Especially popular where overhead structures interfere with fork-lift truck operation is the Floor-Type TRUCK-TOW. All moving parts are located below the floor.

LINK-BELT

TRUCK-TOW CONVEYORS

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa), Sydney (Australia). Offices in Principal Cities. 12,777

MICRO switch *shuts off pump motor when this valve is closed . . .*

Here is the way one plant engineer synchronized the operation of a liquid valve with the motor operating the pump.

He installed a MICRO switch with a roller arm actuator so that opening of the valve handle automatically operates the switch and closes the motor circuit. Closing the valve shuts off the pump motor. "By using this switch with its adjustable lever arm we have a freely adjustable feature not heretofore attainable with any other switch," he says.

Keep up to date on hundreds of other live, practical ideas by reading MICRO Tips. This MICRO publication is full of specific ways plant engineers have made their present equipment safer, more efficient and more productive by installing MICRO switches. Just tell your MICRO distributor you would like to receive MICRO Tips regularly.

MICRO
MAKERS OF PRECISION SWITCHES
FREEPORT, ILLINOIS
A DIVISION OF
MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

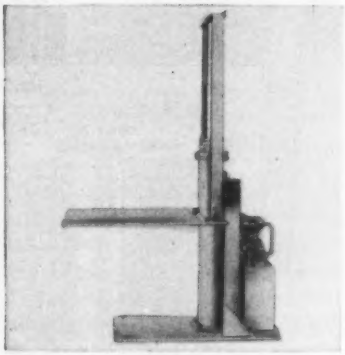
Begins on page 194

remains clamped while any number of operations are performed on the load.

Its self-aligning grip cups with knife-sharp edges cut through paint, grease, scale, rust, and oil.

James Campbell Smith Co., Inc., Willoughby, Ohio.

■



Feed Table Will Speed Production

Designed to speed machine-feeding operations, this oil-hydraulic powered feed table has a rise of 37 inches.

Rise and fall of platform is controlled by a pushbutton, placed within easy reach of the machine operator. Stock pile is inched upward to keep the top piece always at work level.

Standard model has a lifting capacity of 750 pounds.

Globe Hoist Co., E. Mermaid Lane & Queen St., Philadelphia 18.

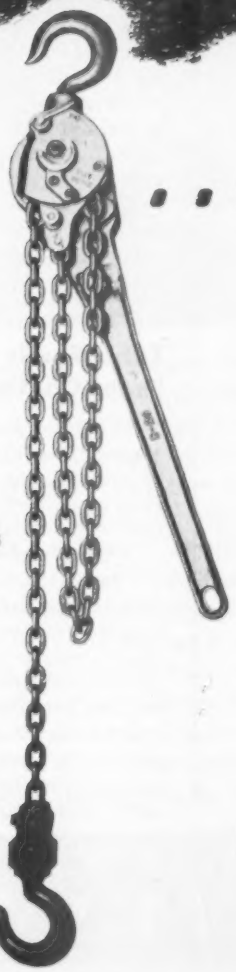
■

BATTERY OPERATED "BUDGIT" ELECTRIC HOISTS developed for mounting on trucks have been marketed by Manning, Maxwell & Moore, Inc., Muskegon, Mich. Have special, 12-volt motors and controllers, and can be installed on trucks with a 6-volt electrical system by adding another 6-volt battery. Hoists are available in capacities of 1000, 2000, and 4000 pounds.

Turn the page

IN FOUNDRY, FACTORY OR MILL

you play it SAFE



. . . with Safety-Pulls

COFFING SAFETY-PULL RATCHET LEVER HOISTS

2 coil chain models, ¾ and 1½ tons
10 roller chain models, ¾ to 15 tons

Just as important as the time- and labor-saving advantages of Coffing Safety-Pull Ratchet Lever Hoists is the way each one protects your men from injury . . . your equipment from damage. Here's why:

Load cannot slip even if handle is accidentally released — because of dual Ratchet and Pawl principle, developed by Coffing and an outstanding Coffing advantage for over a quarter of a century.

Load is held positively at all times — there is no friction brake to slip or freeze.

Hooks will not break or straighten out.

"Safety-valve" handle will bend before any other part of hoist gives way.

Safety-Pulls are single-chain tested at 100 percent above warranted, rated capacity.

Find out more about how Coffing Safety-Pulls provide extra protection on the job. Write for Bulletin M10SP.

COFFING HOIST COMPANY

ORIGINATORS OF RATCHET LEVER HOISTS
DANVILLE, ILLINOIS

Quik-Lift Electric Hoists • Hoist-Alls • Mighty-Midget Pullers • Spur-Geared Hoists
Differential Chain Hoists • Load Binders • I-Beam Trolleys

MEANS
Low Tool Costs
BRAND

Taper Bore hardened and ground

Entire chuck body hardened —inside and out

Jaws nickel Chrome moly Alloy steel...

order from your *Industrial Distributor*

SUPREME PRODUCTS, INC., 2222 S. Calumet Ave., Chicago 16, Ill.
the chuck that lives up to its name . . . SUPREME

MATERIALS HANDLING EQUIPMENT

Begins on page 194

Multi-Use Conveyor Is Easily Stored

Here's a portable conveyor with a power-operated safety screw lift and lowering device. Can be used alone or with other conveyor units for storing, stacking, loading and unloading.

Removable rubber cleats every 60 inches prevent tearing of packages. Instant direction change is provided by a reversible motor.

The conveyor folds in half for easy storage.

Frank A. Kremser & Sons, Inc., 3435 N. 5th St., Philadelphia 40.

■

Table Feeds Sheet Continuously

By adapting a roller top to a standard model table the problem of maintaining a steady flow of strip stock through a punch press has been solved.

A bundle of strip is placed on the roller top table and the table then raised so the top strip is slightly higher than the fixed shelf. Single sheets are transferred from the pile to the shelf and fed lengthwise into the press.

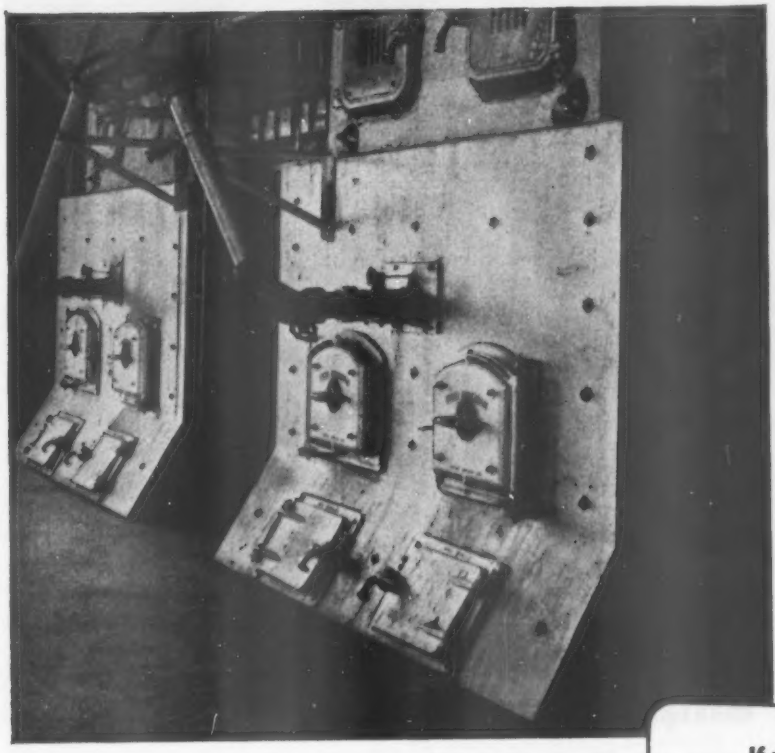
Table top is elevated by a hydraulic foot pedal. The shelf has pin adjustments so it can be used with presses having different bed heights.

The Raymond Corp., 32 105 Madison St., Greene, N. Y.

Turn the page

HOW A SMALL PLANT SAVES BIG MONEY— BY BURNING COAL THE MODERN WAY!

"Modernizing our coal installation cut monthly fuel bills from $777 to $650... labor costs from $120 to only $40!"



says Mr. William C. Musch, Chief Engineer, Allen Memorial Hospital, Waterloo, Iowa.

Here's Allen Memorial Hospital's new steam plant. Boilers are fired by pneumatic spreader stokers. The plant now operates with ⅓ the manpower formerly needed. Compared to the old installation, the new equipment saves 18¢ on every thousand pounds of steam generated. The savings realized by this small plant will pay for the entire installation in 7½ years.

● Whether you plan to modernize your steam plant, or build a new one... whether you burn a lot of fuel, or a little... you can cut a *big* percentage from your operating costs by using up-to-date coal equipment.

A consulting engineer can show you how you can cut labor costs to a minimum with automatic coal- and ash-handling equipment... how you can get more steam for every dollar when you burn coal in a modern installation designed to meet your *specific* needs.

Of all fuels, only coal has ample reserves for the future. And to produce this coal, America has the world's most efficient coal industry. That means that coal users, unlike those committed to other fuels, get the advantages of dependable supply and relatively more stable prices—now and for the future!

If you operate a steam plant, you can't afford to ignore these facts!

COAL *in most places is today's lowest cost fuel.*

COAL *resources in America are adequate for all needs—for hundreds of years to come.*

COAL *production in the U. S. A. is highly mechanized and by far the most efficient in the world.*

COAL *prices will therefore remain the most stable of all fuels.*

COAL *is the safest fuel to store and use.*

COAL *is the fuel that industry counts on more and more—for with modern combustion and handling equipment, the inherent advantages of well-prepared coal net even bigger savings.*

BITUMINOUS COAL INSTITUTE

A Department of National Coal Association, Washington, D. C.

FOR HIGH EFFICIENCY FOR LOW COST

YOU CAN COUNT ON COAL!

How an empty barrel proved

UNOBA RESISTS STEAM!

"Last week I told one of my men to steam out an empty UNOBA barrel for use as a trash container. In about an hour he came back complaining that it couldn't be done. He had used the steam cleaner, with chemicals, for over 30 minutes without visible success. The UNOBA, though slightly lighter in color, was still clinging to the sides of the barrel, and still looked and felt good enough to use. You see, we've been sold on Union's products by their performance."

In this unplanned "test," William Gardner, Equipment Superintendent for J. H. Welsh & Son, Contracting Company, of Phoenix, Arizona, proved again that UNOBA grease resists *extremes* of temperature and moisture.

Like other leading firms, Welsh & Son have found through experience that UNOBA's amazing ability to cling to metal gives outstanding protection against rust and corrosion. And multi-purpose UNOBA has saved them time and money by reducing grease inventories and eliminating the use of the wrong lubricants on expensive equipment.

Give *your* equipment and machines the dependable protection of multi-purpose UNOBA grease.

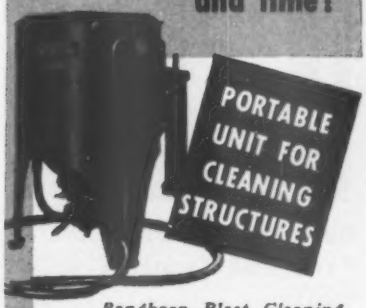
OFFICES: LOS ANGELES: Union Oil Building • NEW YORK: 45 Rockefeller Plaza • CHICAGO: 1612 Bankers Building
NEW ORLEANS: 644 National Bank of Commerce Building

UNION OIL 76 COMPANY OF CALIFORNIA

Large or small jobs—

PANGBORN BLAST CLEANING

cuts maintenance cost and time!



Pangborn Blast Cleaning Machine—Cleans tanks, bridges, buildings, and other structures quickly and economically. Ideal for maintenance and other jobs, such as removal of dirt, scale, rust, etc. preparatory to painting. Six sizes, stationary or portable, from . . . $188 and up..

Pangborn Blast Cabinet—Saves time and money in cleaning small metal parts . . . removing rust, scale, grime, old paint, etc. Produces smooth, clean surfaces on pieces up to 60" x 35" in size. Models from . . . $319 and up.

Pangborn Unit Dust Collectors—Trap dust at the source. Minimize maintenance, allow reclamation of valuable material . . . $286 and up.

Pangborn Hydro-Finish Cabinets—Remove directional grinding lines, hold tolerances to .0001". Reduce further finishing of tools, molds, dies . . . $1410 and up.

Write for details on these machines to: PANGBORN CORPORATION, 2100 Pangborn Blvd., Hagerstown, Md.

Look to Pangborn for the latest developments in Blast Cleaning and Dust Control equipment.

Pangborn

BLAST CLEANS CHEAPER

with the right equipment for every job

WHAT'S NEW IN EQUIPMENT

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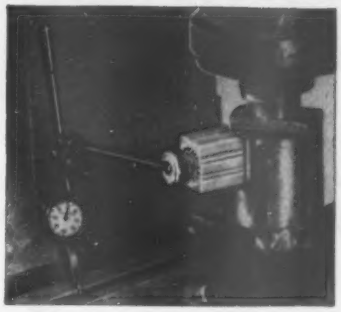
MEASURING & CONTROL



Magnetic Base Holder for Dial Indicators

These magnetic base dial-indicator holders can be mounted instantly to flat surfaces or rounds as small as ¾-in. diameter. Called Tiny-Titan.

The holders, with a magnetic pull of 65 pounds, eliminate awkward clamping. Also they can be speedily adjusted, the maker says.

Enco Manufacturing Co., 4520 W. Fullerton Ave., Chicago 39.

■

Pneumatic Control Indicating Thermometer

A low-unit-cost pneumatic indicating control thermometer provides automatic control advantages to manually regulated processes.

Available with either direct or reverse-acting "on-off" or limited throttler control units. It is housed in a black die-cast aluminum case.

Three reversible mounting clamps permit interchangeable flush or surface mounting on panels of any thickness.

Minneapolis-Honeywell Regulator Co., Wayne and Windrim Aves, Philadelphia 44.

Turn the page

motor design problem?

...maybe one of these **REULAND** *"specials" will solve it!*

Motor with *internal* fluid coupling. Provides smooth load acceleration. More compact than separate motor and coupling. *Assures perfect alignment.* Will start heavier loads than standard motors of same horsepower. Used on cranes, conveyors, mixers, etc.

Consists of Reuland motor and worm gear reducer. Provides unlimited mounting versatility. Permits use of 1 high speed and 2 slow speed power-take-off shafts, if desired. Ideal for designing into cramped quarters. Also available with Fluid-Shaft drive motor.

"Doughnut" type design allows extension of shaft entirely through brake. Permits use of TWO output shafts per motor. Can be mounted on the input or output shafts (or both) of Fluid-Shaft motors and motoreducers. Only 6 major parts . . . self adjusting . . . half usual length.

OVER 600 SPECIAL ELECTRIC MOTOR DESIGNS

There is a good chance the Reuland "library of specials" contains a unit already tailored to your needs. Its availability will save development work and put you in production faster.

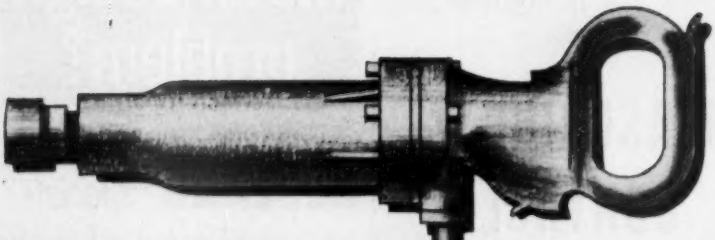
Write today, outlining your particular problem. No obligation, of course.

REULAND
ELECTRIC COMPANY

WESTERN DIV.—Alhambra, Calif. • EASTERN DIV.—Howell, Mich.

DISTRIBUTORS IN ALL PRINCIPAL CITIES

HOW MUCH DOES IT COST YOU...



WHEN A PNEUMATIC TOOL FAILS?

50^{00}?

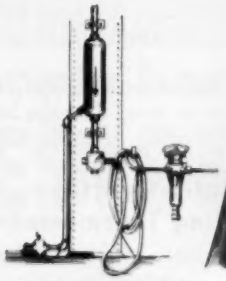
80^{00}?

120^{00}?

One failure of a pneumatic tool costs more than a line type Hi-eF Purifier! These low-cost units installed *immediately* ahead of the air tool keep out of the air line all dirt particles and moisture that materially shorten the life of pneumatic equipment—corroding and wearing out vital parts.

These amazing, low-cost units pay you a rich profit by adding months to the life of your air equipment. Installed in a matter of minutes, they have no moving parts—nothing to wear out, nothing to clog up. See your distributor today. Try one ahead of your most troublesome air tool. Mail coupon for literature and prices.

THE V. D. ANDERSON COMPANY
1997 West 96th Street • Cleveland 2, Ohio



It costs only $13.20 for this Hi-eF Purifier on a 3/4" line.

WATCHDOG *OF STEAM • AIR • GAS • VAPOR PIPELINES AND EQUIPMENT*

ANDERSON Hi-eF PURIFIERS

THE V. D. ANDERSON COMPANY
1997 West 96th Street • Cleveland 2, Ohio

Please send literature and prices on small line type purifiers.

Name ..... Title .....

Company .....

Address .....

City ..... State .....

BY THE MAKERS OF SUPER-SILVERTOP STEAM TRAPS

MEASURING & CONTROL EQUIPMENT

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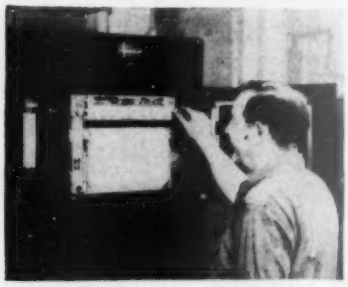


Dew Point Controller For Heat Treating

Here's an automatic dew point controller to regulate the dew point in metal treating furnaces.

Operating electronically, the instrument continuously records and controls the furnace dew point. Furnace dew point is measured directly.

Can be easily attached to atmosphere control panels. Has no calibration or sensing element, thus requires no calibration, maker says.

Ipsen Industries, Inc., Rockford, Ill.

■

Compact, Accurate Integrator-Indicator

Here's a small size integrator-indicator that senses and totals flow rates of liquids or gas every 2.5 seconds. Designed specially for graphic panels.

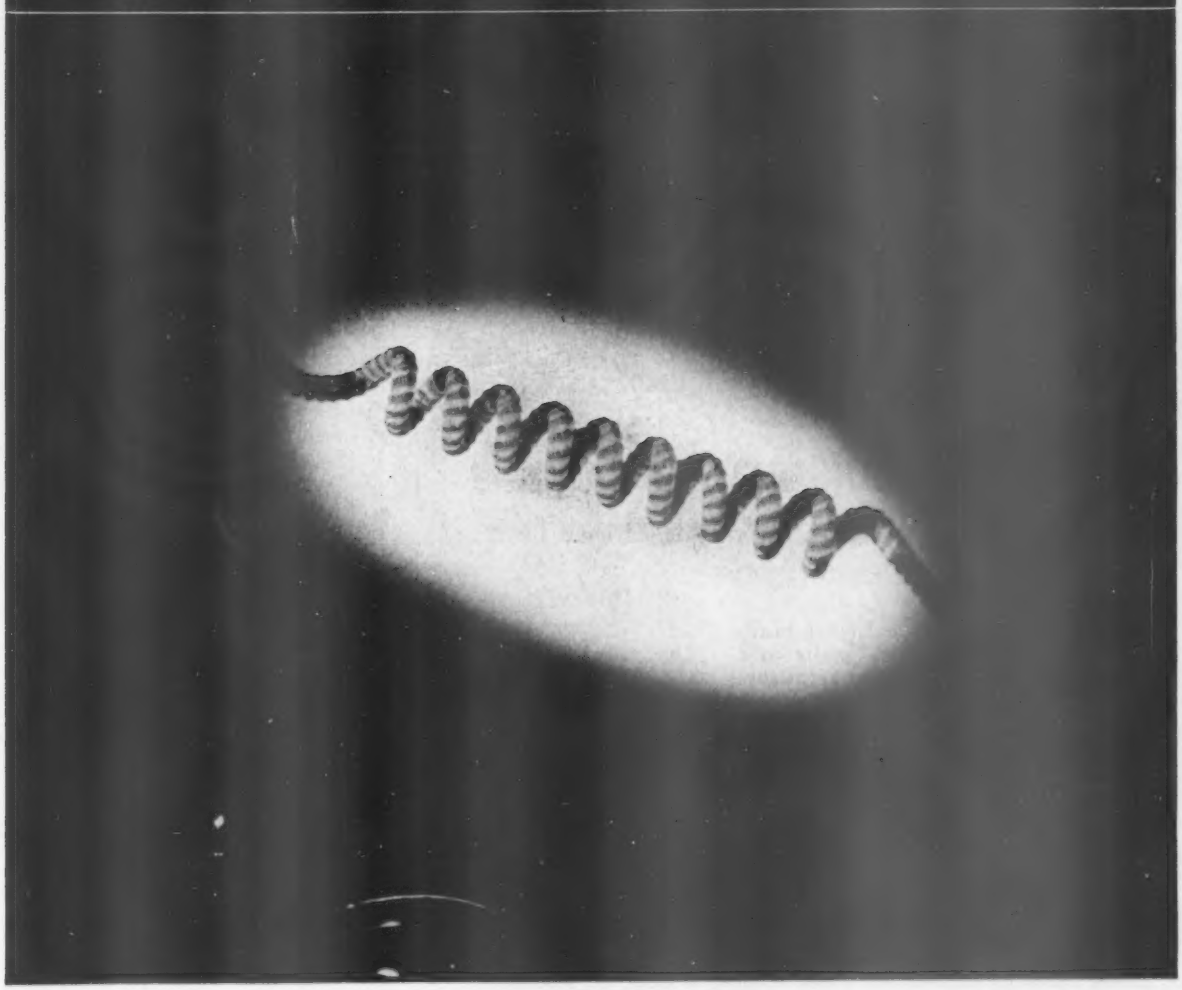
Instantaneous flow rate is indicated by pointer. The pointer is positioned by a pneumatic receiver operating at signal pressures from 3 to 15 psig.

A 100-rpm. synchronous motor sets the timing base for the integrator.

Fischer & Porter Co., 15 Jackson Rd., Hatboro, Pa.

Turn the page

You expect the best value from G-E fluorescent lamps



Extra twist squeezes more light from G-E slimline lamps

The electron flow that lights a fluorescent lamp is started by a special chemical mix held on tungsten filaments at each end of the lamp. How long the lamp lasts depends in part on how long the chemical clings to the filament. In most lamps, the filament is twisted into a double coil, to hold a quantity of the mix in a firm grip.

General Electric goes a step further by giving the double coil a third twist — making a triple coil. Used in G-E slimline and other G-E instant-start lamps, the triple coil holds more mix, and holds it more firmly. It gives you extra light for your money because it makes the lamps last longer. This is another example of why you can expect the best value from G-E fluorescent lamps.

You can put your confidence in—

GENERAL ELECTRIC

. . . THEN WE INSTALLED ALGRIP

And Ended Slipping Accidents And High Insurance Costs!

It happened at a large industrial plant, where oil and grease on a loading platform created a constant hazard. A lift truck skidded on the slippery surface, toppled from the platform's edge, and crushed the operator to death.

Then A.W. ALGRIP Abrasive Rolled Steel Floor Plate was installed on the platform—and slipping accidents ended at once. For ALGRIP is truly non-slip—even on steep inclines! Hundreds of tiny abrasive particles in each square foot of ALGRIP converted the slippery, dangerous platform into a hard gripping, anti-skid surface—safe for men and vehicles alike.

IMMEDIATE SAVINGS were obtained in three ways: *(1) No more costly, morale shattering accidents. (2) Faster handling of loads. (3) Workmen's compensation insurance premiums were substantially reduced by more than enough to pay for the* ALGRIP *installation.*

END SLIPPING ACCIDENTS THAT STEAL PRODUCTION AND KITE INSURANCE RATES

A.W. ALGRIP—only abrasive rolled steel floor plate in the world—pays for itself in savings from safety. Tough abrasive particles (same kind used in grinding wheels) put hundreds of tiny safety-brakes in every footstep—make it virtually impossible to slip even on steep inclines. ALGRIP doesn't wear smooth either—wear only exposes new particles. And tough rolled steel makes this floor plate stronger than other abrasive floorings. For safety at a saving, get the full ALGRIP story today. Write for our new Booklet AL-30—without obligation.

Over 125 Years of Iron and Steel Making Experience.

ALGRIP Abrasive Rolled Steel Floor Plate

ALAN WOOD STEEL COMPANY

CONSHOHOCKEN, PA.

Other Products: A. W. SUPER-DIAMOND Floor Plate • Plates • Sheet • Strip (Alloy and Special Grades)

MEASURING & CONTROL EQUIPMENT

Begins on page 207

Controller Closely Regulates Temperatures

Here's a temperature controller that will hold your process temperatures with no under- or over-shooting. It is called the Stepless Controller.

It has no relays and supplies only enough power to the heating element to hold temperature for which it is set. Operates on full power only on initial temperature rise.

West Instrument Corp., 525 N. Noble St., Chicago 22.

■

Pressure or Flow Differential Meter

An electronic package deal for controlling and/or recording differential pressures or flow has been announced. The heart of the package is the differential-pressure transmitter.

The package will give instantaneous response and negligible zero shift. In addition, initial cost is low and installation and maintenance are simple, maker says.

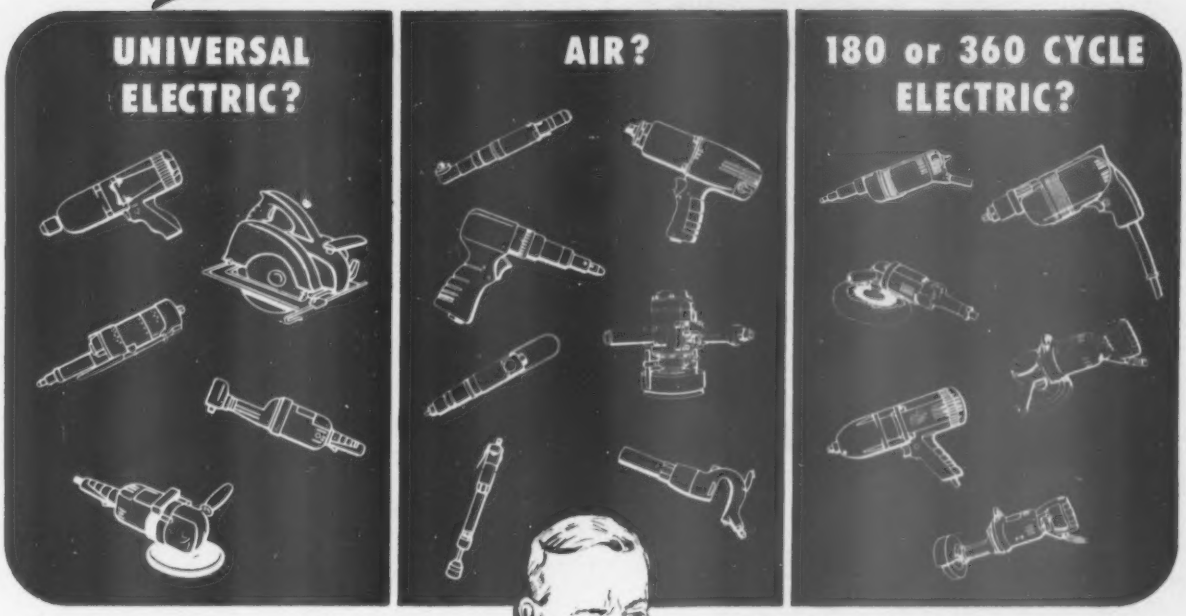
The Swartwout Co., 18511 Euclid Ave., Cleveland 12.

■

ELECTRONIC RECORDERS of either the potentiometer pyrometer or resistance thermometer bridge type are being made by the Thermo Electric Co., Fair Lawn, N. J. Cover temperature recording ranging from –100 to 3000 F. Can also be used for indicating humidity, solution conductivity, speed, pH, d-c current and voltage, power, and other measurements that can be converted to changes in resistance or d-c millivoltage.

Turn the page

Thor HAS THE ANSWERS!



Produce More at Lower Cost With Portable Power Tools

60 years in the business, with over 1,500 different types of power tools available, *THOR POWER TOOL COMPANY* is well qualified to give you sound, impartial advice on *ALL* portable power tool problems.

Thor—and only *Thor—specializes exclusively in the manufacture of portable power tools . . . of ALL types.*

For money-saving, cost-cutting *IDEAS*, write for Thor Power Tool Catalogs or a "get acquainted" call from a Thor service engineer. Thor Power Tool Company, Aurora, Ill. *Sales and Service Offices in Principal Cities.*

YOUR FILES ARE INCOMPLETE if you do not have the latest Thor Tool catalogs covering Thor Air Tools, Thor Universal Electric Tools, Thor 180 Cycle and 360 Cycle High Frequency Electric Tools. Use coupon below.

Thor TOOLS

UNIVERSAL ELECTRIC	Augers	Core Busters	Lubricators	Rivet Busters	Spike Drivers
	Backfill Tampers	Couplings	Nail Drivers	Rivet Squeezers	Tappers
AIR	Balancers	Feed Mechanisms	Nut Setters	Rock Drills	Valve Reamers
	Belt Sanders	Fender Hammers	Paving Breakers	Sanders	Valve Seat Grinders
HIGH FREQUENCY ELECTRIC	Bench Grinders	Files	Pin Drivers	Saws	Wire Brush Machines
	Chisels	Grinders	Polishers	Scaling Hammers	Wood Borers
	Chipping Hammers	Hammers	Pumps	Screwdrivers	
	Clay Diggers	Hoists	Rammers	Sheet Metal Nibblers	
		Impact Wrenches	Reamers		

THOR POWER TOOL COMPANY
Aurora, Illinois

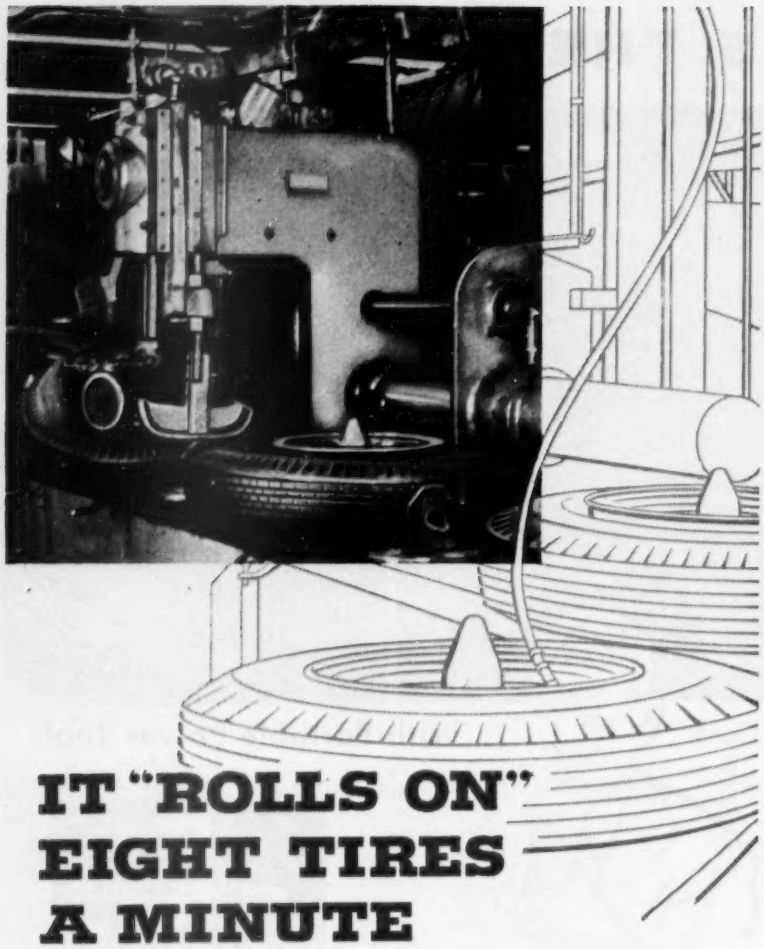
Please send catalog covering Thor
- ☐ Air Tools ☐ Universal Electric Tools
- ☐ 180 Cycle High Frequency Electric Tools
- ☐ 360 Cycle High Frequency Electric Tools
- ☐ Please have your service engineer call

Your Name_____

Company_____

Street_____

City & State_____



IT "ROLLS ON" EIGHT TIRES A MINUTE

An example of MHS practical imagination in designing materials handling and automation

The mounting head descends, the roller swings around once and a tire is mounted. The reciprocating head, which has followed the conveyor through mounting distance, rapidly returns to "roll on" the next tire.

In a constant stream—480 tires an hour—this MHS installation loads wheels, mounts tires, inflates them, installs stone guards, delivers complete wheels in sets by automatic transfer to an overhead conveyor.

This compact installation doubles tire mounting production, reduces manpower requirements by two-thirds, saves space, and ends the problem of pinched tubes.

* * *

Mechanical Handling Systems has created and installed materials handling systems for the leaders of American industry since 1919. This long experience and proven ability is at your service. *Call in the MHS engineer on your materials handling and production problems.*

Mechanical Handling Systems Inc.

4608 Nancy Ave., Detroit 12, Michigan

Offices in Principal Cities

In Canada: Canadian Mechanical Handling Systems Ltd., Toronto

MEASURING & CONTROL EQUIPMENT

Begins on page 207

Thermostat Controls Rate-of-Heat Rise

A thermostat to control rate of heating and prevent temperature overshoots has been developed.

Designed to regulate temperature rise to proper level from a cold start at any rate desired. From here on the instrument acts as a safety check.

Will control heating rates between 10 and 100 degrees F. per minute. Used for ambient temperatures between -100 and 550 F.

Fenwal Inc., Ashland, Mass.

■

Transmits Reading Over Single Circuit

A multiplexing transmitting and receiving system for use with Metameter Telemeters has been developed. With this equipment 15 readings taken at different locations can be transmitted any distance over one circuit.

Telephone circuits, carrier current, private wires, or telemeter circuits can be used for transmission.

The Bristol Co., Waterbury 20, Conn.

■

A CONVEX SCALE REMOTE READING GAGE that makes it possible to take liquid level readings from anywhere in the control room has been made by the Jerguson Gage & Valve Co., 80 Fellsway, Somerville 45, Mass. Scale markings directly on the gage face permit full 180-deg. visibility.

■

A PORTABLE INSTRUMENT FOR CHECKING REVOLUTIONS PER MINUTE of motors, machinery and revolving shafts has been marketed by Montgomery and Co., Inc., 53 Park Pl., New York 7. Just press the instrument's rubber tip against the revolving shaft, and read the rpm. directly off the dial.

Turn the page

Acme Steel announces

revolutionary new advance in wire stitching

NEW ARCUATE WIRE STITCH
NEW
Acme Steel Arcuate Stitching forms flat wire into arc for greater strength
OLD
Ordinary flat wire stitch has less holding strength than Arcuate Stitch of same wire size
ORDINARY FLAT WIRE STITCH

In Acme Steel's new Arcuate stitching method, flat stitching wire is formed into an arc, increasing its column strength, making a smoother stitch with lighter wire, delivering up to 42% more stitches per pound of wire. Faster, too!

New Acme Steel Arcuate Stitching cuts wire costs 24 per cent

HERE'S HOW IT WORKS: Wire stitching has long been favored for assembling and closing of cartons of all types. Now "Stitching Headquarters"—Acme Steel Company—announces a new stitching method: Arcuate Wire Stitching.

In Acme Steel's new Arcuate Stitching method, regular flat stitching wire is formed into an arc by the stitching machine, making a stronger stitch so you can use lighter gauge wire for boxmakers' joints or any other stitching jobs. Increased column strength makes each stitch easier to drive. Stitches drive straighter, clinch better, hold tight.

RESULT: You save 24% in wire costs. You get 42% more stitches from each coil of wire (using .103 x .014-inch instead of .103 x .020-inch wire, for example). Arcuate Stitching virtually eliminates machine jamming—reduces down time and produces perfect stitches more consistently. This means that you can stitch more cartons per day, and get a better-looking carton every time.

It's easy to adapt your present equipment. There are conversion parts-kits for most popular model stitching machines.

CALL your Acme Steel representative for all information. Or, for a free folder giving complete details and a stitched sample, write to Acme Steel Products Division, Dept. FMM 103, Acme Steel Company, 2840 Archer Ave., Chicago 8, Illinois.

FREE →

Get the details . . . send in the coupon for a free folder on Acme Steel's new Arcuate Stitching.

ACME STEEL

STITCH IT . . . STRAP IT . . . SHIP IT . . . SAFELY!

ACME STEEL CO., Dept. FMM-103
2840 Archer Ave., Chicago 8, Illinois

Please send me free copy of your new folder on Arcuate Wire Stitching and a stitched sample.

*Name*_____

*Company*_____

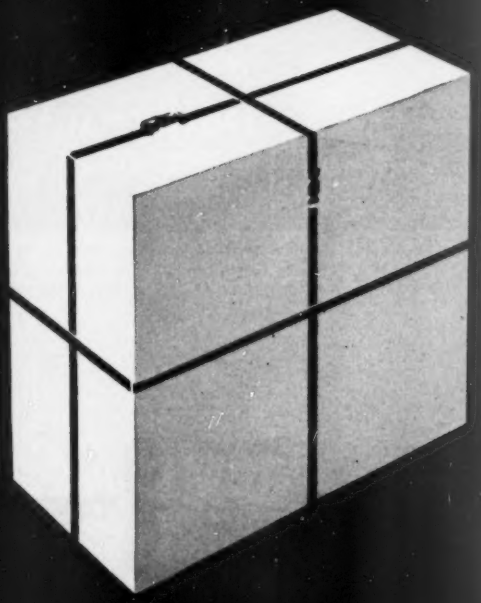
*Street Address*_____

*City*_____ *Zone*____ *State*_____

the "Seal of Security" for over forty years

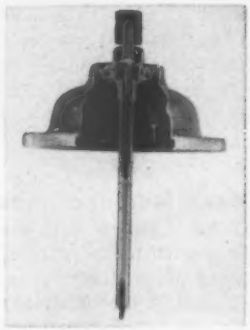
30,000 manufacturers believe in this *Seal of Security* in shipping. Wherever you see this seal, you are observing the result of the most extensive research and development in the steel strapping industry. For example, Signode operates the only railroad test-track used exclusively for perfecting methods of bracing freight car shipments. Signode was the first to make available to industry fully automatic power machines for applying steel strapping on production lines. Signode maintains a staff of trained engineers working on development in the field solely for the benefit of customers.

Signode has but one business—one aim—to bring every shipper, large or small, the cost-cutting, profit-building advantages inherent in steel strapping in order to produce maximum *security in shipping.*



SIGNODE STEEL STRAPPING COMPANY
2660 N. Western Avenue, Chicago, Illinois
In Canada: Canadian Steel Strapping Co., Ltd.
Montreal • Toronto

PAINTS & PROTECTIVE COATINGS



Self-Cleaning Valve for Paint Dispensing

Here's a self-cleaning valve specially designed for dispensing paint from pressurized cans. Called the Clean-O-Matic Valve.

To eliminate clogging conditions, a rod automatically cleans the valve every time it's opened or closed. This breaks any seal formed in the syphon tube.

Seymour of Sycamore, Inc., Sycamore, Ill.

■

Neoprene Coating for Cotton Gloves

Glove-Kote is a Neoprene coating to make cotton gloves wear longer, resist water, grease, and oil, and increase hand protection.

Can be applied quickly and easily with brush or can be rubbed in by wearer of the gloves. It's economical too, maker says.

Glove-Kote can also be used to water-proof and repair work aprons, tarpaulins, and canvas.

Industrial Adhesives, Inc., 4208 Airport Rd., Cincinnati 26.

Turn the page

Security of Unit-Pack Assured

Through the magic of Signode Steel Strapping Unitizing Methods!

Here you see how 160 units, formerly packaged in many containers, were packed on ONE easily handled pallet-pack—the adaption by Signode of a *basic* unitizing method—to save containers, man power, and time, and to prevent pilferage!

The chances are that your products, entirely or in part, can be handled and shipped more economically and securely by applying the principles of a *basic* unit-pack method. Why not find out now? Ask to have a Signode fieldman call.

Write Signode Steel Strapping Co., 2663 N. Western Ave., Chicago 47, Ill. Offices coast to coast. In Canada: Canadian Steel Strapping Co., Ltd. Foreign subsidiaries and distributors worldwide.

SIGNODE Steel Strapping Co.

SEND FOR FOLDER SHOWING 6 BASIC WAYS OF UNITIZING

CUT YOUR SWEEPING COSTS

Wilshire POWER SWEEPERS

75%

WILSHIRE

POWER SWEEPERS

Free DEMONSTRATION PROVES IT

If you are still sweeping by hand, you are paying for a WILSHIRE Power Sweeper...so why not *own* one? There is a WILSHIRE model for every sweeping requirement . . . inside and outside. Easy to operate, easy to maintain and WILSHIRE sweeps 8 to 40 times faster than a man with a broom. Users in hundreds of different industries are saving as much as 75%. Write or wire for illustrated brochure and data on savings you can make.

WILSHIRE POWER SWEEPER COMPANY • 526 W. Chevy Chase Drive • Glendale 4, Calif.

Easy to use . . . Easy to clean . . . Easy to service

DERBY SEALER MODEL 32 GUMMED TAPE DISPENSER

For Shipping Room and Production Line Packaging

• Rugged simplicity aptly describes the Model 32. Derby's exclusive, one-piece solid casting eliminates parts and provides added rigidity. What's more, the Model 32 is easy to clean, even during the hot summer months when machines tend to "gum-up."

• The Derby Model 32 accommodates any tape from 1" to 3" wide. Delivers from 4 inches to 34 inches of tape at one stroke.

• Derby's exclusive "moisture-control" system maintains a maximum high water level in the tank to assure a constant supply of water to the brush, no matter how fast tape is dispensed.

• Also available is the Model 32-T with tool steel shear-type blades for cutting reinforced strapping tapes. Blades have two cutting edges to double their useful life before resharpening.

For further information, write Dept. FMM

DERBY SEALERS, INC.

Derby, Connecticut

PAINTS AND PROTECTIVE COATINGS

Begins on page 215

Strippable Coating for Tools and Parts

A low-cost, strippable protective coating to prevent corrosion and abrasive damage to metal tools and parts during storage, handling, and shipping has been developed.

Called Thermo-Cote, it is applied by hot-dip process. After the dip, parts can usually be handled in one or two minutes.

Ernst Bischoff Co., Inc., Ivoryton, Conn.

■

ONE-COAT HIGH-HEAT ALUMINUM PAINT for exterior use on metal surfaces with temperatures ranging from 400 to 1000 F., has been formulated by The Tropical Paint & Oil Co., Cleveland 2. Called Thermalite and having a heavy silicone content, it fuses to the surface. Will not discolor, blister, flake, or burn off, maker adds.

■

PAINT-LIKE ROOF INSULATING COATING that can be brushed or sprayed on has been developed by the Everseal Manufacturing Co., 250 W. 57 St., New York 19. Called Lowtemp, it is used as it comes without heating or thinning and can be applied to existing roof surfaces.

■

SILICONE MAGNET WIRE ENAMEL, known as Dow Corning 1360, has the same life expectancy at 200 C as conventional enamels have at 105 C. Flexibility and scrape abrasion resistance also compare favorably says the maker, Dow Corning Corp., Midland, Mich.

■

A ONE-COAT ALUMINUM PAINT that resists all types of weather and retains its aluminum coloring has been developed by the Joseph Dixon Crucible Co., Jersey City 3, N. J.

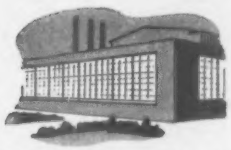
Turn the page

Put Liquid Aluminum to work in your plant!

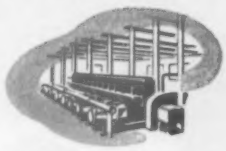
Sparkling *Liquid Aluminum* is amazingly resistant to rust . . . resists corrosion from smoke and fumes, too! It reflects up to 85% of heat and light rays—makes plant interiors brighter—minimizes expansion and contraction problems—reduces evaporation losses.

Look for the *Liquid Aluminum* label on the aluminum paint you choose for its countless uses inside and outside your plant. It is made to approved minimum standards by many leading paint manufacturers and is available through your regular paint supplier. Or write for names of manufacturers to Reynolds Metals Company, 2518 South Third Street, Louisville 1, Kentucky.

Reduce Maintenance Costs... Increase Plant Efficiency



Extends life of rustable metal windows—eliminates cost of frequent repainting.

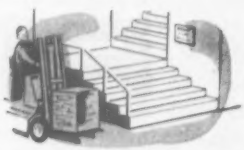


Brightens plant interiors to improve employee efficiency and morale. Repaints with one coat.

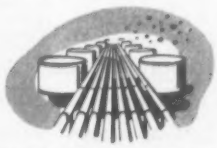
Protects and improves appearance. Makes standout background for plant signs.

Provides added insulation for piping—cuts heat losses—protects and beautifies.

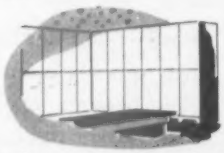
Improves visibility in faintest night light—prevents emergencies from becoming disasters.



Makes stairs safer when applied to risers. In stairwells it also improves lighting.



Reflects sun's heat rays to hold down inside temperatures—reduce evaporation losses.



Seals masonry against moisture in locker and shower rooms—in humid processing areas.

SPECIFY *LIQUID ALUMINUM* WITH ASPHALT FOR ROOF PAINT OR COATING.

Here's economical, lasting, one-coat protection for your built-up or your rustable metal roofs! *Liquid Aluminum* Roof Paint or Coating reflects harmful sun rays . . . protects against all kinds of weather . . . adds years to roof life by retarding decomposition of the asphalt. *The Liquid Aluminum* label and the special Warranty Seal are your assurance of quality roof protection. Write for folder with more complete information.

This advertisement appears in the interest of the Paint Industry of America.

The vise that's a handy portable workbench

RIDGID

New No. 40 Tristand Pipe Vise

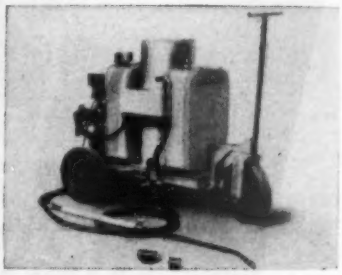
Easily taken to the job—legs fold in and chain for carrying, tray quickly on and off. Roomy top has pipe rest and efficient benders; tray keeps tools handy—and also makes Tristand extra rigid, won't fold up in use! Tool-steel Longrip jaws—firm grip but easy on polished pipe and tubing. Yoke No. 40, (old TSY-2½) 2½"; chain No. 45 (old TSC-4) 4". Buy these handy worksavers at your Supply House.

THE RIDGE TOOL COMPANY • ELYRIA, OHIO • U. S. A.

RIDGID
Work-Saver Pipe Tools

Begins on page 168

PLANT HOUSEKEEPING & SANITATION



Easily Movable Steam Cleaner

This steam cleaner offers maximum utility through easy movement on 4 rubber-tired wheels. Called "JO" Hypressure Jenny.

A nozzle control system lets operator stop and start unit at the cleaning job even if it's 100 feet from the Jenny.

From a cold start, a full powered blast can be delivered in 90 seconds. A zippered canvas cover protects the unit against weather.

Homestead Valve Mfg. Co., Coraopolis, Pa.

■

Vacuum Attachment for Dust Pick-Up

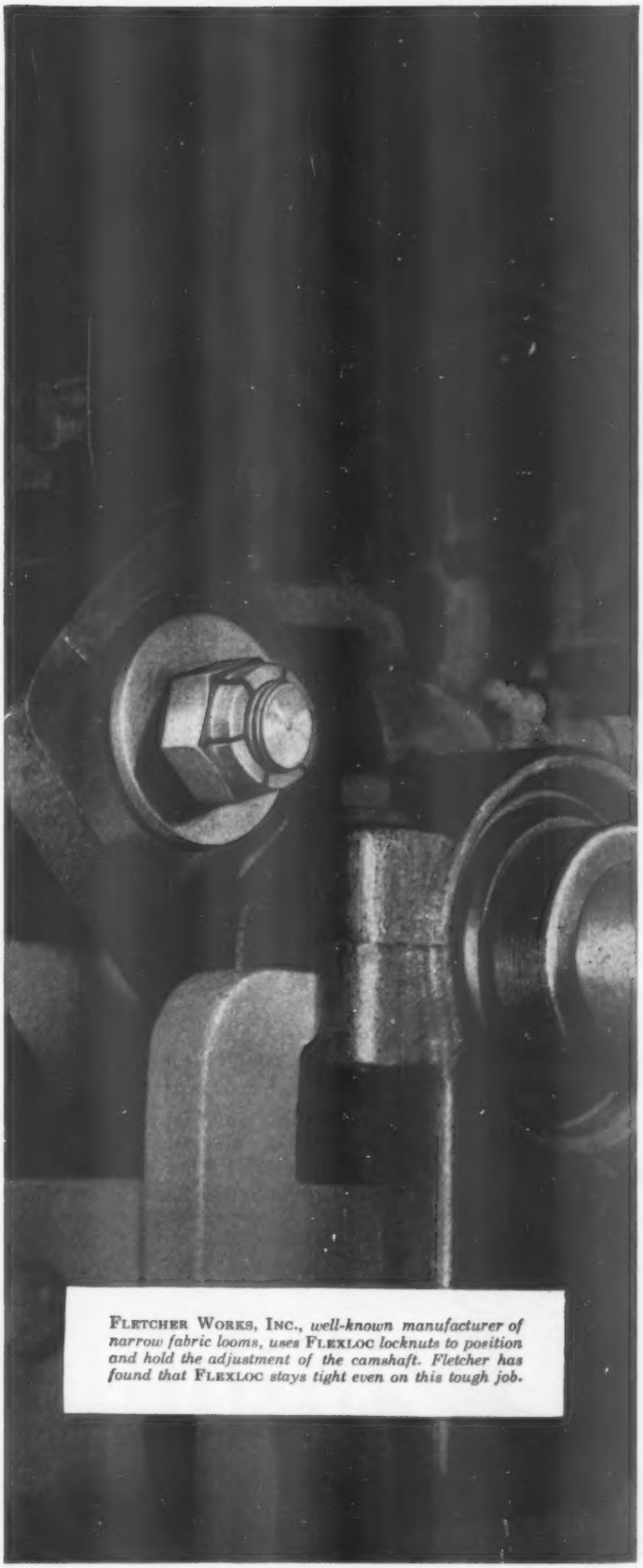
A dust pick-up vacuum attachment for Multi-Clean floor machines doing light and finish sanding has been announced.

Unit can be attached or detached in less than 10 minutes. It is operated by a 1-hp. motor that is mounted on the handle.

Floor machine can be operated independently or in conjunction with the vacuum.

Multi-Clean Products, Inc., 2277 Ford Pkwy., St. Paul 1.

Turn the page



FLETCHER WORKS, INC., *well-known manufacturer of narrow fabric looms, uses* FLEXLOC *locknuts to position and hold the adjustment of the camshaft. Fletcher has found that* FLEXLOC *stays tight even on this tough job.*

How FLEXLOC locknuts reduce maintenance

FLEXLOCS reduce maintenance by staying where you put them. Once they are installed, you can forget them. Service and inspection periods can be stretched safely from days to weeks.

And FLEXLOCS eliminate complicated, time-consuming methods of locking threaded fasteners. They offer faster, simpler application, and safer, more dependable locking than plain nuts and lockwashers, castellated nuts and cotter pins, or nuts and jam nuts.

Use FLEXLOCS wherever you use an ordinary nut. These one piece, all metal locknuts—with nothing to assemble, come apart, lose or forget—won't work loose regardless of the vibration encountered. Yet they can be easily removed and used over and over again. FLEXLOCS are stop and lock nuts too. They don't have to seat to lock, and they stay put anywhere on a threaded member as soon as the locking threads are fully engaged.

You can get FLEXLOCS in a wide range of sizes in any quantity. Stocks are carried by leading industrial distributors everywhere. Write for literature and samples. SPS, Jenkintown 11, Pa.

FLEXLOC®

LOCKNUT DIVISION

SPS

JENKINTOWN PENNSYLVANIA

Our Fiftieth Year : A START FOR THE FUTURE

NEW PORTABLE SCALES • NEW COUNTING SCALES • NEW FLOOR SCALES

NEW PRINTWEIGH SCALES • NEW TRACK SCALES • NEW HOPPER SCALES • NEW BUILT-IN SCALES

NEW BENCH SCALES • NEW MOTOR TRUCK SCALES • NEW MILK RECEIVING SCALES • NEW OVER-UNDER SCALES

44 Ways Better...

A great new line of Toledos! *44 new features* are now added to the traditional accuracy and dependability of Toledo Scales including—double pendulum mechanism in one-piece sector design . . . dial installed to face any of eight directions . . . new clean-line design with handsome gray finish. Complete range of types and capacities. Get your scale information up-to-date . . . write today for the new condensed catalog No. 2001. Toledo Scale Company, Toledo 1, Ohio.

Model 2181—New version of the world's most widely used portable dial scale.

Today more than ever

TOLEDO®

HEADQUARTERS FOR SCALES

PLANT HOUSEKEEPING & SANITATION

Begins on page 218

Multi-Purpose Floor Machine

Here's a heavy duty floor maintainer for use on all types of floors and able to do many maintenance jobs.

The basic machine can be quickly adapted with accessory brushes and pads to perform scrubbing, waxing, polishing, shampooing, buffing, dry cleaning, grinding, and sanding operations, the manufacturer says.

Comes in three models that are powered by 1/3-, ½-, and ¾-hp. motors.

Premier Co., 755 Woodlawn Ave., St Paul 1.

■

Industrial Fume and Dust Eliminators

Two units for industrial fume and dust elimination have been developed. One unit is for wet collection and elimination only, while the second is a combination primary dry and secondary wet collection unit.

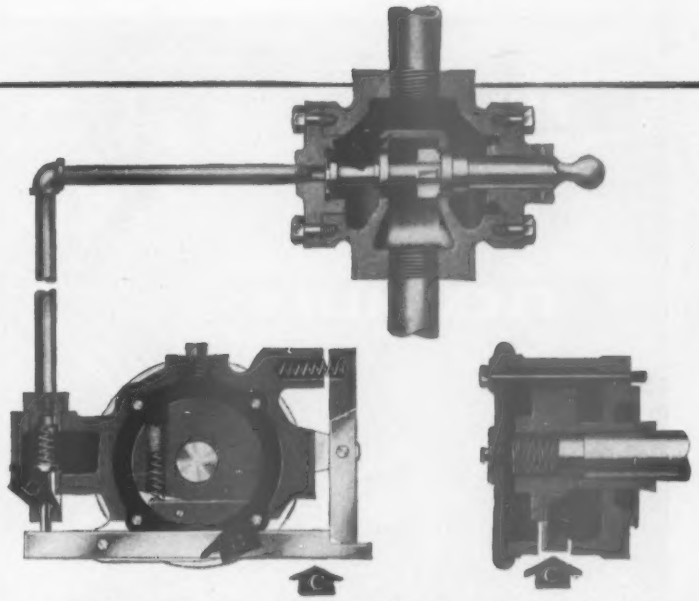
Both combine cyclonic principle of dust separation with high pressure water action for removal of impurities. Liquids other than water can be used for some applications, the maker says.

Capacities from 500 to 50,000 cfm.

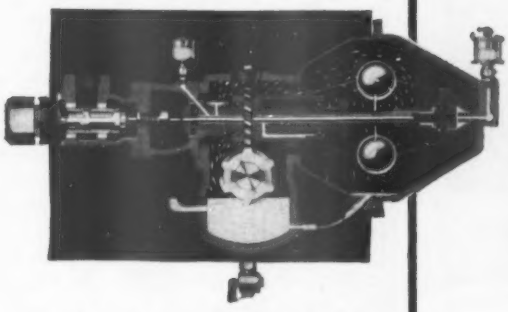
Schmieg Industries, Inc., P. O. Box 4701, Detroit 34.

Turn the page

Only Coppus Turbines offer you *a pilot operated* excess speed safety trip



The constant speed governor on Coppus Turbines, plus this Excess Speed Safety Trip, gives you extra protection for your turbine investments. Here's how it works. When steam is turned on, pressure opens valve A fully. When excess speed is reached, centrifugal force throws weight B against lever C lifting pilot valve D. This releases pressure in back of valve A, closing this valve instantaneously, to shut off the steam. Safety trip can be tested easily while turbine is running by manually tripping and resetting lever C.



Sectional view showing lubricating system of fully enclosed Coppus Constant Speed Governor. Governor head acts directly on stem of steam admission valve. No external levers required. Ball bearing construction eliminates end play and gives frictionless operation.

Coppus Turbines ranging from 150 hp down to fractional in 6 frame sizes

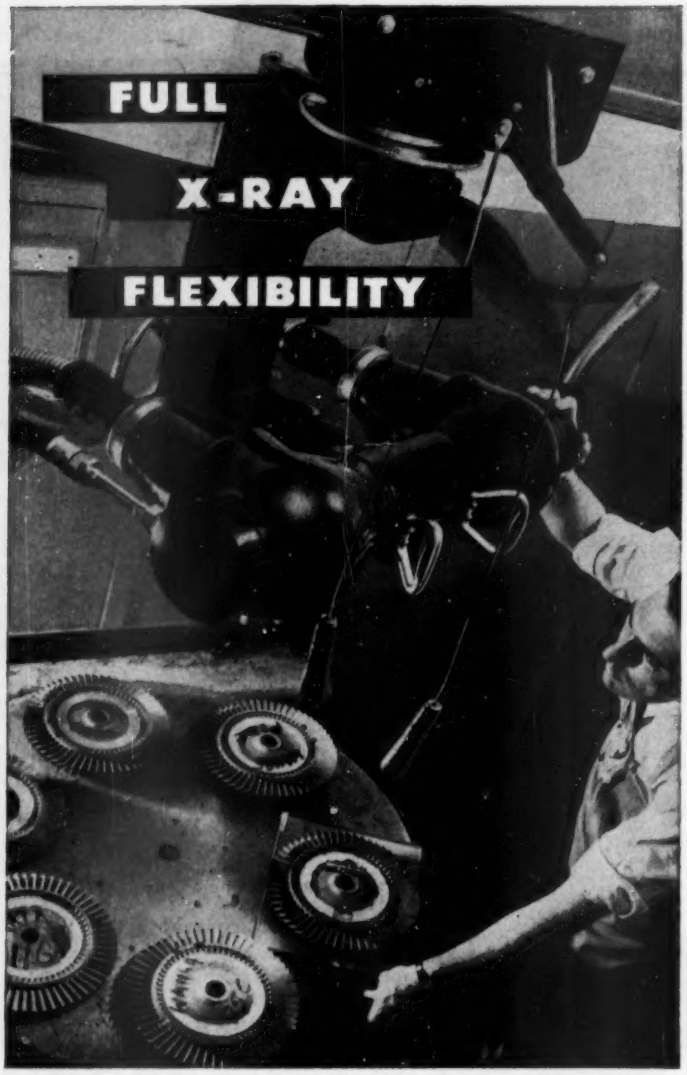
CUT YOUR COSTS PER HORSEPOWER

When you choose from the Coppus Steam Turbine line, you get the right size for your requirements . . . and make substantial savings on *any* size from the 150 hp turbine down to the smallest. Low in first cost, Coppus Turbines save you more money in the long run. Operating and maintenance costs are kept low by such other features as: large number of steam nozzles, controlled individually by manually operated valves; hard chromium plating on shaft at the stuffing box; replaceable cartridge type bearing housings; optional carbon ring packing assembly for back pressures up to 75 pounds.

WRITE FOR BULLETIN 135

COPPUS ENGINEERING CORPORATION, 110 Park Ave., Worcester 2, Mass. Sales offices in THOMAS' REGISTER.

COPPUS "BLUE RIBBON" TURBINES



WESTINGHOUSE 250 KV JIB CRANE X-RAY UNIT

Curtiss-Wright uses Westinghouse X-ray equipment for nondestructive testing of vital parts of their outstanding aircraft engines. Here, they're examining critical welds on gas turbine booster rotors. Prime reason for selection of Westinghouse equipment was *flexibility*—since *flexibility* results in more radiographs per shift.

Kilovoltage on this unit varies from 30 to 250, with greater X-ray output per KV because of constant potential high voltage generator. Result: unit is capable of inspecting materials ranging from 1/8" aluminum to 4" steel.

Jib crane tubestand and X-ray tubehead flexibility allows maximum ease of positioning in radiographing parts of all sizes and shapes. Result: time is saved, output is stepped up.

Call in the Westinghouse X-ray representative, or write Westinghouse Electric Corporation, Industrial X-ray Section, 2519 Wilkens Avenue, Baltimore, Maryland. J-06265

YOU CAN BE SURE...IF IT'S

Westinghouse

Begins on page 168

SAFETY & PLANT PROTECTION

Safety Mask Has Extra O_2 Supply

Here's a 30-minute self-contained, breathing mask that has an extra 5-minute supply of oxygen. When the large cylinder is exhausted, all you do is turn on the small cylinder for more oxygen.

This eliminates need for constantly checking the oxygen supply when working on emergency jobs.

The safety mask is called Pocketaire and weighs 8½ pounds. It can be recharged from any standard oxygen cylinder.

Cycle-Flo Co., Milford, Conn.

■

SIX-POINT COMBUSTIBLE GAS INDICATOR AND ALARM to give sequential sampling of potentially explosive atmospheres has been marketed by Johnson-Williams, Ltd., 2634 Third St., Palo Alto, Calif. In operation the unit draws samples continuously through metallic tubing and analyzes them point by point on a 30-sec. cycle. Unit operates on 115-volt a-c, 50-60 cycles.

Turn the page

NOW – NEMA Type XII

THE ONLY SAFETY SWITCH IN SPECIAL INDUSTRY ENCLOSURE!

CAPTIVE SCREWS assure tight cover fit

EXTERNAL MOUNTING FEET eliminate need for conventional leaky mounting holes within the enclosure

NEOPRENE GASKET provides positive cover seal

WELDED TIGHT ENCLOSURE without knockouts excludes dirt, dust, oil, and splashing coolant

This new heavy duty switch, built to NEMA XII specifications, is "tailor-made" for applications requiring the exclusion of dirt, dust, oil and coolant.

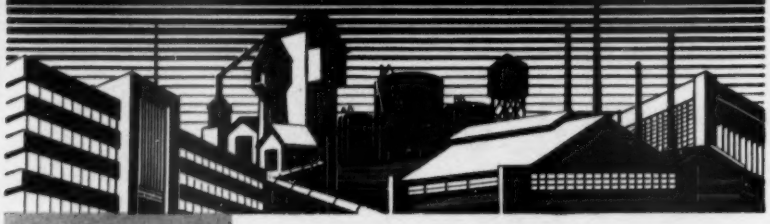
The rugged, visible-blade switch mechanism within the special industry enclosure has all the performance features that have made Square D an overwhelming "first choice" for fifty years.

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

SQUARE D COMPANY

1903 • 50 YEARS OF DESIGN LEADERSHIP • 1953

we put the "Automatic" in FIRE PROTECTION



"Automatic" Fire Alarm Systems
For all types of business
"Automatic" Sprinkler Systems
For industrial, commercial and institutional properties
"Automatic" CO_2 Systems
On-the-spot protection for many industrial fire hazards
"Automatic" Air Foam
For petroleum and chemical processing properties
"Automatic" FIRE-FOG
Protects high voltage electrical equipment
"Automatic" Dry Chemical Systems
For many special hazards

You've no doubt read or heard from time to time that one or another type of fire protection is the correct answer to your safety problem. One says foam is best. Another says water sprinklers are the answer. Perhaps carbon dioxide, dry chemical, or other media will do the trick.

What is the most effective method?

Without a thorough understanding of all conditions involved, we wouldn't hazard a guess. For fire protection, like any other scientific problem, requires (1) technical know-how, and (2) application of that knowledge. Most methods of fire safety are good . . . but only through "FIRE PROTECTION ENGINEERING"—designing, manufacturing and installing the specific type of system *best by test*—can you be sure of maximum safety.

So, we take all methods of fire alarm and control, combine them with extinguishing mediums—FIRE-FOG, Air Foam, Sprinklers, etc.—and compound the results by adding "Automatic" technical know-how as well as test and field experience. The result . . . the finest "Automatic" FIRE PROTECTION available at any price.

The subject is more vividly covered in our colorfully illustrated literature, "The ABC of Fire Protection." Write for free copy today.

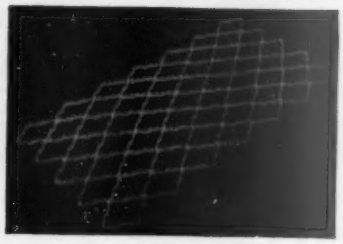
"Automatic" Sprinkler

CORPORATION OF AMERICA . YOUNGSTOWN, OHIO

OFFICES IN PRINCIPAL CITIES OF NORTH AND SOUTH AMERICA

SAFETY & PLANT PROTECTION

Begins on page 222



Non-Skid Grilles

Heres' a light-weight grille to provide safe footing on slippery floor areas and steep inclines. It's called Coroweld Non-Skid Grille.

Available in various sizes for installation in spots where slipping and skidding are a hazard.

Bustin Firm - Grip Grating Corp., 110 E. 130 St., New York 37.

■

GOGGLES FOR WELDERS AND CHIPPERS called Saf-I are being manufactured by the United States Safety Service Co., 1215 McGee, Kansas City 6, Mo. The goggles feature good ventilation, light weight, and comfort without sacrificing strength and durability, says the maker. Special scratch-resistant plastic lenses are available with the chippers' goggles.

■

SEECLOTH is a chemically treated cloth for cleaning and mistproofing goggles, glasses, masks, windows, and truck windshields. Developed by Hygiene Research, Inc., 684 Broadway, New York, it is said to be effective for from 2 hours to 2 weeks.

■

COMPACT SAFETY LADDER that will not tip even when a top-heavy load is applied has been designed by D. O. Kepler, 34 Reed St., Marcellus, N. Y. Safety feature is made possible, says the maker, by extension of the backlegs beyond the plane of the top tread.

Turn the page

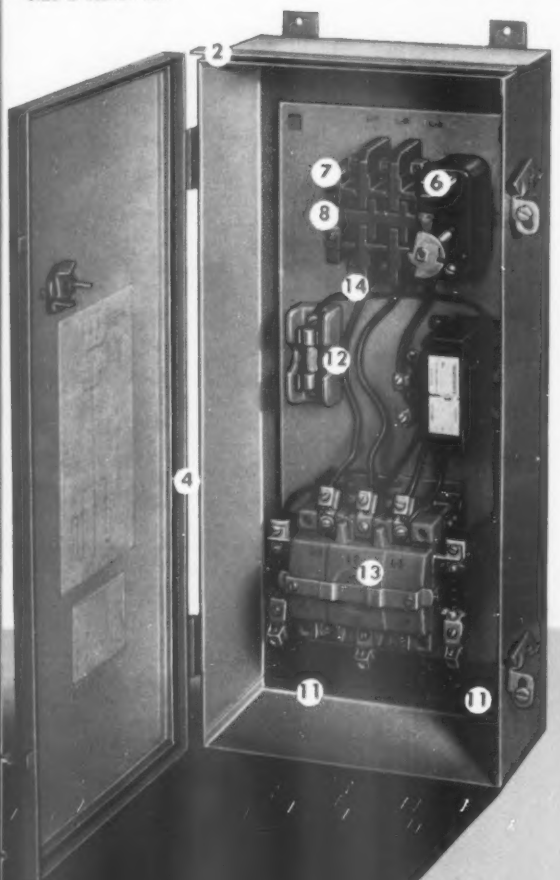
INDUSTRY ASKED for it...HELPED US DEVELOP it...

AND *Here it is!*

THE NEW TYPE "RAC" ARROW AH HART COMBINATION STARTER

NEMA TYPES I, IA and XII

SIZE 2 NEMA XII



Features:

FOR NEMA XII

1. **HEAVY, SEAM WELDED CONSTRUCTION** . . . with no knockouts.
2. **OIL DRIP SHIELD** . . . prevents collected oil from dropping on starter when door is opened.
3. **EXTERNAL MOUNTING BRACKETS** . . . let oil drain down behind enclosure.
4. **OIL PROOF NEOPRENE GASKET** . . . retained by both cement and channel.
5. **AUTOMATIC LATCHES** . . . hold door securely even if locking screws are accidentally left loose.

FOR ALL-NEW DISCONNECT

6. **HEAVY SILVER CONTACTS** . . . for long life.
7. **CONTACTS COMPLETELY VISIBLE** . . . maintenance man can SEE that the Disconnect is off.
8. **CONTACT CARRIER INSTANTLY REMOVED** . . . for inspection or replacement.
9. **SIMPLE, SAFE, STURDY MECHANISM** . . . **COVER CAN'T BE OPENED WITH DISCONNECT ON** . . . handle must be turned to "Open" with Disconnect "Off".
10. **HANDLE PROVIDES FOR 3 LOCKS** . . . can only be locked in the "Off" position.

GENERAL

11. **ENTIRE COMBINATION REMOVABLE** . . . from box by merely loosening two non-removable screws.
12. **TRANSFORMER FUSED ON SECONDARY SIDE.**
13. **TYPE "RA" STARTER** . . . with exclusive "Right Angle" Operating Mechanism.
14. **ALL CONTROL WIRING *RED*** . . . **ALL LINE WIRING BLACK.**
15. **SMALLER SIZE** . . . Size 1 unfused . . . entire unit is just 15⅜" x 7½" x 4⅜".

ENGINEERED FOR SAFETY

NEMA TYPE XII built to JIC STANDARDS

TURN THE PAGE FOR ADDITIONAL INFORMATION

ENTIRELY NEW
OUTSTANDINGLY ADVANCED
EXACTLY RIGHT FOR INDUSTRY'S NEEDS

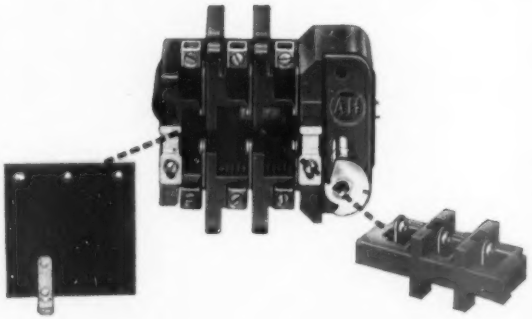
ARROW AH HART

TYPE "RAC" COMBINATION STARTER

Leading Machinery Engineers throughout industry worked with us to develop this all-new, "RAC" Across-the-Line Combination Starter. The NEMA Type XII is designed, engineered and constructed to meet all JIC Standards for Safety, Oil Tightness and Convenience in both operation and maintenance. In addition, the Type "RAC" offers smaller size plus new standards of electrical performance and dependability . . . possible only with the exclusive Arrow-Hart "RA" Starter Design.

Incorporating EXCLUSIVE "RA" DESIGN with All-New "RAD" DISCONNECT

The "RAD" Type Disconnect is a completely new, front operated design that offers many important advantages for both safety and convenience. The operating mechanism is simple and rugged with a safe "Off" position. The enclosure door of the "RAC" cannot be opened unless the operating handle is moved to the "Open" position and the Disconnect is off. The handle has provision for three padlocks and can be locked only in the "Off" position. The butt-to-butt type contacts of heavy silver are provided with a clip-on cover that may be used or not as desired. When this cover is removed, the contacts are completely visible for easy inspection . . . and to give the maintenance man an additional *visual* assurance that the Disconnect is off. The Contact Carrier . . . held in place by two swinging latches . . . can quickly and simply be removed entirely for fast, easy inspection, maintenance or replacement.



Available

- With GENERAL PURPOSE (NEMA TYPE I) ENCLOSURE
- With SEMI-DUST (NEMA TYPE IA) ENCLOSURE
- With OILTIGHT (NEMA TYPE XII) ENCLOSURE
- With DISCONNECT . . . Fused or Unfused Type
- With CIRCUIT BREAKER TYPE DISCONNECT
- REVERSING and TWO SPEED TYPES
- In NEMA SIZES 0, 1 and 2 . . . with Sizes 3 and 4 coming soon
- With or without CONTROL CIRCUIT TRANSFORMER

SEND NOW FOR COMPLETE INFORMATION ON THE TYPE "RAC" COMBINATION STARTER

AH

Industrial Control Division
THE ARROW-HART & HEGEMAN ELECTRIC COMPANY
103 Hawthorn Street, Hartford 6, Conn.

Please send me complete product literature covering:
☐ *Type "RAC" Combination Starters* ☐ *"RA" Motor Control Design Story*

NAME_____
POSITION _____
COMPANY_____
CO. ADDRESS_____
CITY_____ ZONE_____ STATE_____

ARROW-HART
INDUSTRIAL CONTROL DIVISION
THE ARROW-HART & HEGEMAN ELECTRIC COMPANY
HARTFORD 6, CONNECTICUT

OFFICES, SALES ENGINEERS AND WAREHOUSES IN: ATLANTA, BOSTON, BUFFALO, CHARLOTTE, CHICAGO, CINCINNATI, CLEVELAND, DALLAS, DETROIT, HOUSTON, INDIANAPOLIS, KANSAS CITY, MO., LOS ANGELES, MILWAUKEE, MINNEAPOLIS, NEW YORK, PHILADELPHIA, PITTSBURGH, ST. LOUIS, SAN FRANCISCO, SYRACUSE. Sales Engineers in Columbus O., York, Pa., Fayetteville, New York, Manchester Ct., Seattle, Springfield Mass. In Canada: ARROW-HART & HEGEMAN (CANADA) LTD., ST. CATHARINES, TORONTO.

VALVES & FITTINGS

Pressure Reducing and Regulating Valve

A single-seated, spring-loaded oil pressure reducing and regulating valve has been developed. It is the direct acting diaphragm type.

Automatically reduces high pressure to low and maintains the low pressure regardless of fluctuations on the high pressure side, manufacturer says.

Any restriction forces valve wide open and has a self-cleaning effect on the seat. A built-in strainer safeguards the working parts.

Eclipse Fuel Engineering Co., Rockford, Ill.

■

Shut-Off Valve for Vacuum Work

A packless shut-off valve specially designed for vacuum applications, instrumentation, processing, pneumatic service and similar uses has been marketed.

The solid Teflon diaphragm is chemically stable and will resist most liquids and gases. It is designed to withstand unlimited openings and closings.

Recommended for pressures up to 300 psi. Temperature range is -100 to 450 F.

The Imperial Brass Mfg. Co., 1200 W. Harrison St., Chicago 7.

■

HEAVY-DUTY AIR HOSE, for pressures up to 400 psi. has been announced by the B. F. Goodrich Co., Akron. It is reinforced with a single braid of high-tensile steel wire. Comes in ½-, ¾-, and 1-in. sizes.

Turn the page

Production your problem?

If your current product situation has you worried—rejects high, volume low, quality control off—your personnel may need the lift of work-music supplied by RCA Sound.

A paper cup manufacturer with RCA Sound in his plant reports these amazing facts:

- **81% of listening employees agree that music helps relieve fatigue.**
- **93.3% agree it helps relieve monotony of work.**
- **95.2% say time goes faster with work music.**
- **RESULT: "improvement in attitude toward work" by all employees—increases in efficiency up to 10% by 63.4% of employees.**

If production is your problem, an RCA sound system may be the answer. True, listenable reproduction has made RCA Sound industry's favorite. RCA engineering and service have made it the best-liked system in plants, schools, and commercial buildings throughout the country. In thousands of plants RCA Sound is on the job every working day.

RCA's 26 years in industrial sound assure you of successful in-plant operation. This broad technical and practical background offers all the benefits of comfort-engineered sound—eliminates the discomfort of poor sound performance.

Speak anywhere in your plant

Use your RCA sound system to convey general messages throughout your plant. Use it for paging, for emergency instructions, for noontime entertainment by amateurs or professionals. It's a handy tool for getting things done fast . . . it's an important lift to employees' spirits.

How LOUD must music be to drown out Factory NOISE?

Surprisingly, it's not entirely a matter of loudness. Pleasurable listening requires tonal balance—a blending of high and low frequency responses. RCA's sound equipment is designed to produce the sound combinations that overcome noise.

For facts on RCA sound systems and the nation-wide facilities of the RCA Service Company, call your local RCA sound distributor today, or mail the coupon for RCA's 12-page booklet, *A New Industrial Giant.*

MAIL COUPON NOW

Sound Products, (Dept. 48V)
Radio Corporation of America, Camden, N. J.

Please send me your free booklet on RCA Sound, *A New Industrial Giant.*

Name_____

Title_____

Company_____

Address_____

City_____ Zone_____ State_____

RCA **RADIO CORPORATION of AMERICA**

Here's the crane that assures 97.5% DRIVE EFFICIENCY

Full Vision Cab With Magnetic Control—Provides a clear view of entire working area. Whiting design magnetic control assures smooth acceleration, improved accuracy, more protection for motors.

Herringbone Type Gears—Used by Whiting on all high speed reductions of drive units and in second reduction of hoist units for longer gear life, less impact and shock, improved lubrication!

5 to 450 Tons Capacity! Whiting cranes cover the full range of handling needs for all industries. This 115 ton capacity Whiting Crane is used in steel mill service.

The double reduction drive, designed and used by Whiting on cranes up to 50 tons in capacity, provides an overall drive efficiency of 97.5 per cent . . . much higher than triple reduction types. Elimination of excess dead weight reduces power requirements and cuts operating costs. Single, easy to remove housing simplifies maintenance of entire drive unit!

In every Whiting crane, from hook to bridge end truck, you get the proved advantages of applied experience in crane manufacture . . . for handling power that's safer, longer lasting, easier to use and to service. Whether you're lifting 5 tons or 450 tons, Whiting can help you . . . write for complete information today!

WHITING CORPORATION
15689 Lathrop Avenue, Harvey, Illinois

Other Whiting Material Handling Equipment:
The Whiting Trackmobile,
Trambeam Overhead Handling Systems,
Whiting Electric Chain Hoists.

VALVES & FITTINGS

Begins on page 225

CONTROLLED POROSITY OF LEATHER SEALS AND PACKINGS is obtained by impregnation with oil-resistant liquid polymers, followed by further polymerization within the leather. Developed by the Chicago Rawhide Manufacturing Co., 900 N. State St., Elgin, Ill. Said to have flexibility, strength, stability, resistance to oils and solvents and good aging properties.

■

AIR RELEASE AND VACUUM BREAKING VALVE for use wherever air accumulations are found in pipe lines or where water flow is hampered by air binding. Designed by the Simplex Valve & Meter Co., 68th & Upland Sts., Philadelphia 42, the valve has a 2-in. threaded inlet opening and can be used under working pressures up to 150 psi.

■

A 5-BOLT LINE BLIND VALVE to provide either a full diameter, round opening or a permanent leakproof shut-off has been announced by the Hamer Oil Tool Co., Long Beach, Calif. As standard make is constructed of carbon steel, maker says service life is practically unlimited and maintenance is low.

■

FLUORLASTIC GASKETING MATERIAL combines the resilient properties of silicone rubber with the chemically inert properties of fluorocarbon resins, Teflon and Kel-F. Made by the Connecticut Hard Rubber Co., 407 East St., New Haven, Conn., it is finding many uses.

■

STEAM-BLASTING CLEANING NOZZLE that will reduce labor costs for steam cleaning and stripping operations has been marketed by the American Nozzle Corp., 30 Church St., New York 7. It has a center blade designed to produce a harder-hitting impact.

Turn the page

Facts prove the economy of RUST-OLEUM®

Apply Directly Over Sound Rusted Surfaces

Just scrape and wirebrush to remove rust scale and loose particles — then brush Rust-Oleum 769 Damp-Proof Red Primer *directly over sound rusted surface.*

Lasts Longer Applied Directly Over Rust

Sandblasting, chemical pre-cleaning and other costly preparation methods are *not* usually required. Rust-Oleum penetrates the rust to bare metal, incorporating the rust particles into the coating.

Many Colors, Including Aluminum, and White

Rust-Oleum finish coatings incorporate the same basic rust-inhibiting vehicle as Rust-Oleum 769 Damp-Proof Red Primer. They provide *double protection* and enable you to *beautify as you protect.*

Practical Answer to Your Rust-Producing Conditions

Rust-Oleum resists rain, snow, heat, fumes, sun, salt water, and chemicals. So easy to use by brush, dip, or spray that one man often does the work of two.

Proved Throughout Industry for Over 25 Years

Indoors and out, Rust-Oleum has *proved* its capacity to stop rust! Rust-Oleum can do the same for your tanks, metal sash, stacks, girders, roofs, buildings, machinery, pipes, etc.

An Exclusive Formula

Rust-Oleum is *distinctive* as your fingerprint. It incorporates a specially-processed fish oil vehicle that *dries*, is *odor-free*, and is formulated in *many colors*. Specify Rust-Oleum — accept no substitutes.

There Is Only One Rust-Oleum

RUST-OLEUM STOPS RUST!

ATTACH TO YOUR LETTERHEAD — MAIL TODAY!

RUST-OLEUM CORPORATION
2452 Oakton Street, Evanston, Illinois

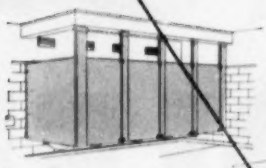
- ☐ Have a Qualified Representative Call
- ☐ Free Survey
- ☐ Complete Literature
- ☐ Nearest Rust-Oleum Industrial Distributor

FIAT®

THE COMPLETE LINE OF

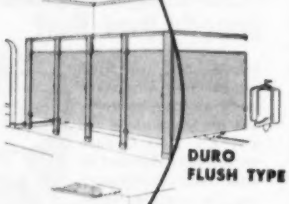
toilet compartments

Write for illustrated catalog



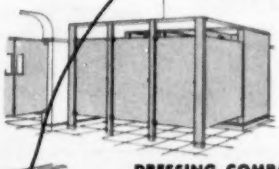
ARISTO CEILING HUNG

ARISTO FLOOR SUPPORTED

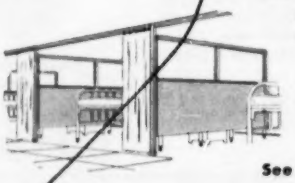


DURO FLUSH TYPE

PERMO PANEL TYPE



DRESSING COMPARTMENTS and SHOWERS



FIAT HOSPITAL CUBICLES

For more efficient, attractive and sanitary toilet facilities, plus ease of maintenance, install FIAT compartments. FIAT'S complete line of Toilet Compartments, Showers and Dressing Compartments offer adaptability to any type installation . . . whether new or old.

All FIAT compartments are made of the finest stretcher leveled furniture steel finished in a durable, easy to clean finish that can really take rough treatment.

Send for the FIAT compartment catalog showing the latest improvements such as: theft proof screws, concealed type fastenings and sound-proofed panel cores. FIAT compartments are available in either white or a choice of eight other colors, or a combination of any two of these colors.

See SWEET'S $\frac{21b}{Fi}$ ARCHITECTURAL

. . . or write for CATALOG No. 530

MADE BY

FIAT®

FIRST IN SHOWERS

FIAT METAL MANUFACTURING COMPANY

THREE COMPLETE PLANTS—ECONOMY • CONVENIENCE • SERVICE

Long Island City 1 New York | Franklin Park, Ill. (Chicago Suburb) | Los Angeles 63 California

In Canada: Porcelain and Metal Products, Ltd., Orillia, Ontario

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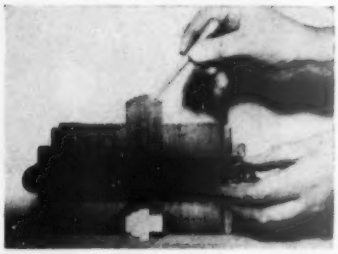
MISCELLANEOUS



Profile Template for Contour Work

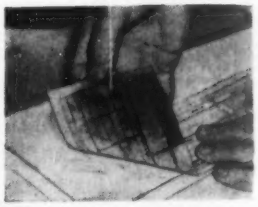
Here's an adjustable template to speed up transfer of a design outline. Will give a profile of almost any piece for contour work.

Brass strips, .007-in. thick, make the device useful for fine work. There are approximately 900 strips in the 6-in. template.

The strips are pushed into position by hand, then clamped into place by knurled nuts.

John A. Lowe Co., 18 Toronto St., Toronto, Canada.

■



Time-Saver for Draftsmen

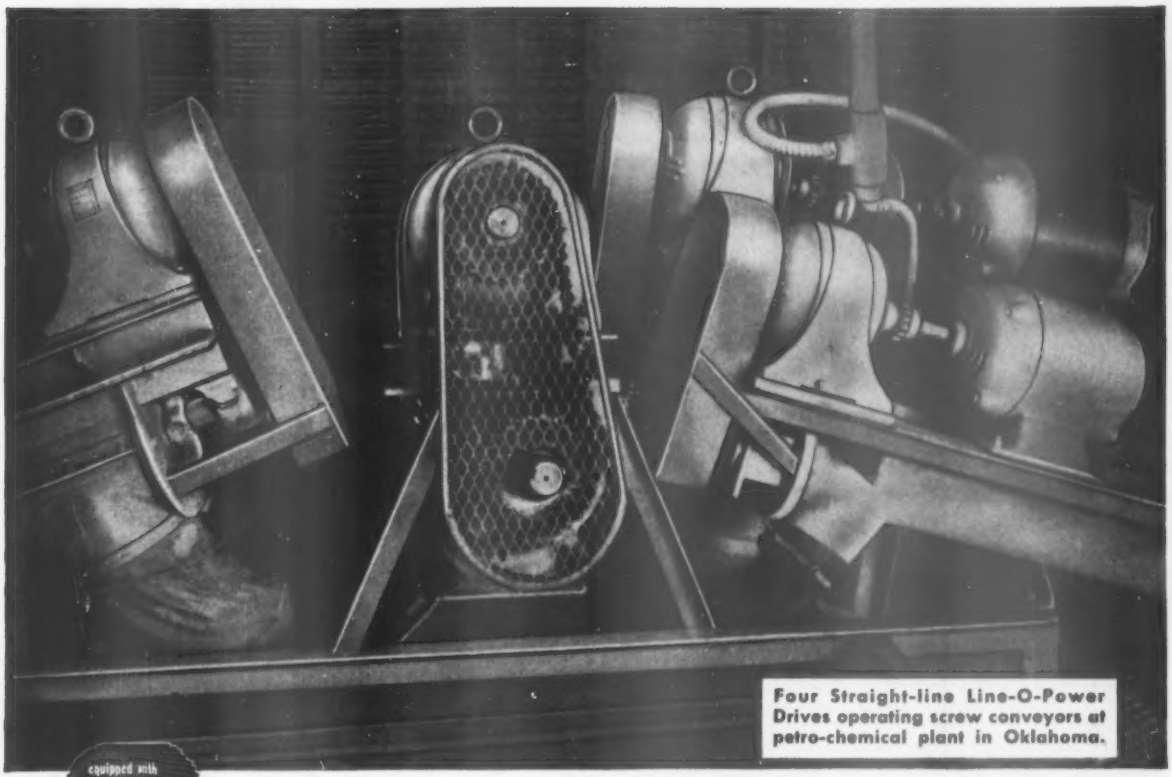
Transeals are designed to eliminate rubber stamps and time-consuming hand-lettering, symbol-drawing, and ruling on engineering drawings.

Tailored to each company's requirements, they are made of thin, transparent printed plastic sheet with a pressure-sensitive adhesive coating.

Transeals are easily applied.

Johnson Research Corp., Bethpage, N. Y.

Turn the page



Four Straight-line Line-O-Power Drives operating screw conveyors at petro-chemical plant in Oklahoma.

equipped with FOOTE BROS. Duti-Rated LIFETIME GEARING

This Trademark Stands for the Finest in Industrial Gearing

solve your space and weight problem . . . with LINE-O-POWER*

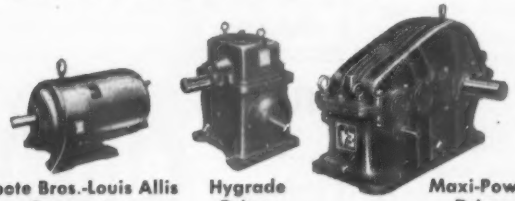
When limited space governs a reducer's size — when weight is a critical factor — LINE-O-POWER is your drive.

Line-O-Power Drives are smaller, lighter, more compact — yet offer almost any reduction you need — because Duti-Rated Lifetime Gearing assures maximum load-carrying capacity in minimum space. Newly-developed Duti-Rated Gears have high hardness, extreme accuracy — permit *big* savings in size and weight.

Longer life — higher efficiency — quieter operation — these are Line-O-Power advantages, brought about by Duti-Rated Lifetime Gearing, unmatched in the industrial gear field.

Sturdy Line-O-Power Drives are available for prompt delivery — in straight-line or right-angle design — with foot or flange mountings — for horizontal or vertical service. Talk over your requirements with the Foote Bros. representative, or write for helpful information.

*REG. U. S. PAT. OFF.



Foote Bros.-Louis Allis Gearmotors | Hygrade Drives | Maxi-Power Drives

FOOTE BROS.

Better Power Transmission Through Better Gears

Foote Bros. Gear and Machine Corporation
Dept. I, 4545 South Western Boulevard, Chicago 9, Illinois
Please send information about Line-O-Power Drives.

- ☐ Bulletin LPB on Straight-Line Units.
- ☐ Bulletin LWA on Right-Angle Units.

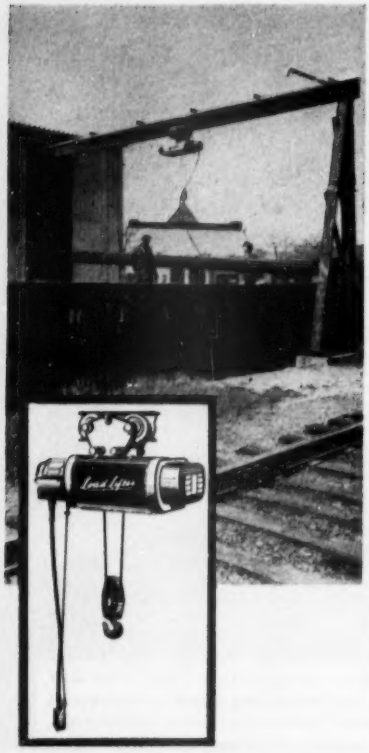
Name.....

Position.....

Company.....

Address.....

City..... Zone..... State.....



MAKES MORE LIFTS ON ALL SHIFTS

High production costs are frequently due to slow, tedious handling methods. The "Series 700" 'Load Lifter' Electric Hoist is fast and efficient. At the push of a button, the 2000-lb. size lifts its load a half foot per second. One hand is always free to guide the load. More units are handled per hour, economically.

The 'Load Lifter' is a rugged, heavy-duty hoist. Steel suspension, powerful synchronized load and motor brakes, heat-treated helical gears, non-fracturing hook — all contribute to dependable, safe service on the toughest jobs. For extra safety, there are only 24 volts at the push button.

Let the 'Load Lifter' boost your production 'round the clock. Get the operational and maintenance advantages of simple design. Capacities: ½-ton and up; single and two-speed control. Your "Shaw-Box" Distributor has complete information. Write for 'Load Lifter' Electric Hoist Bulletin 399.

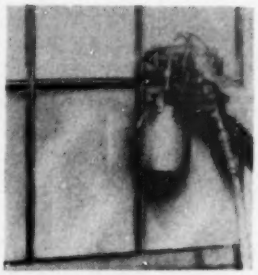
'Load Lifter'®
ELECTRIC HOISTS

MANNING, MAXWELL & MOORE, INC.
MUSKEGON, MICHIGAN

Builders of "Shaw-Box" and 'Load Lifter' Cranes, 'Budgit' and 'Load Lifter' Hoists and other lifting specialties. Makers of 'Ashcroft' Gauges, 'Hancock' Valves, 'Consolidated' Safety and Relief Valves, 'American' Industrial Instruments, and Aircraft Products.

MISCELLANEOUS EQUIPMENT

Begins on page 228



Thermoplastic Cuts Sun's Heat and Glare

For protection against the sun's heat and glare two thermoplastic products have been marketed. Thermoglare Film is a spray-on-plastic coating (shown above) and Thermoglare Sheet is a solid sheet plastic.

Both products are weather resistant and can be used on exteriors of windows and sashes as well as interiors.

Eastern Industrial Service, Inc., 17 Day St., Cambridge 40, Mass.

■

Flooring Withstands High Temperatures

A heat resistant flooring that withstands thermal shock and will not deteriorate under extremely high temperatures has been marketed.

Aluminum rods embedded about 1 inch below the surface disperse heat rapidly. This design enables it to be used where temperatures range up to 2000 F., the maker claims.

Can be used 24 hours after installation.

Flash-Stone Co., Inc., Philadelphia, Pa.

■

HYDRAULIC DOOR CHECK AND CLOSER, self-contained and simple in construction, has been marketed by the Kant-Slam Door Check Co., 10 W. Spring St., Bloomfield, Ind. Attached to the door itself, it will hold doors open when required.

WHERE TO BUY

Pipe Repair CLAMPS

Made for every type of leak—any temperature or pressure. Send for Catalog No. 41-O.

M. B. SKINNER CO., SOUTH BEND 21, INDIANA

STOP that WATER

With FORMULA NO. 640, a clear liquid which penetrates 1" plus in concrete, brick, stucco, plaster, etc. Seals out water, dirt. Holds 20' head. Use outside and in. Preserves all absorbent materials. Sold 14 years. Quick, economical, sure. $3 in 55's. Free sample. See Sweet's.
HAYNES PRODUCTS CO., OMAHA 3, NEBR.

For FREE Sanitary Survey
OF YOUR PREMISES CONSULT
YOUR DOLGE SERVICE MAN OR WRITE:
DOLGE
WESTPORT, CONNECTICUT

CAR SNOW PLOW
CLEARS ROADS & DRIVEWAYS

Fits any car, jeep, truck. Attached in 2 minutes. Clears snow 24" deep and width of car. Lightweight, sturdy. Free literature.
ESHELMAN, Dept. SP10
119 Light St. Balt. 2, Md.
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FLUX
for
SODERING
SILVER SODERING
WELDING
BRAZING

AT IT SINCE '93 ALLEN 500

L. B. ALLEN CO., INC.
6781 BRYN MAWR AVE., CHICAGO 31, ILL.

STOP DUST

DUSTKOPS — 22 Models
UNIT TYPE — 300 cfm to 10,000 cfm
LOW COST — ¼ hp to 15 hp

AVAILABLE FROM STOCK

For: Grinders, buffers, polishers, woodworking, lint . . . ALL DUSTS

Send for Cat. 605t; describe problem for recommendation by return mail, without obligation

AGET-DETROIT CO. • ANN ARBOR, MICH.

FLUXES
for
SODERING
BRAZING
WELDING

AT IT SINCE '93 ALLEN 500

Send for Samples

L. B. ALLEN CO., INC.
6781 Bryn Mawr, Chicago 31, Ill.

Steam can KILL

Special tube assures extra long life.
Braided steel wire plies create tremendous strength and safety.
Spiral cord asbestos breaker ply makes heat-resistant bond between cover and carcass.
Extra-tough cover withstands external abrasion.
HY-TEST
Our Second Century of Service to Industry

Tame it with HY-TEST Hose!

Hy-Test just *can't* burst and spray out live steam . . . steam that can scald and even kill! Here's why. Hy-Test hose is reinforced with several rubber-encased plies of closely-woven *braided-steel wire* that prevent sudden failure.

After long and severe service, harmless seepage through these blowout-proof plies provides ample warning of the need for replacement.

Add to this safety feature a specially-compounded steam-resistant inner tube, a breaker ply of spiraled asbestos cord that keeps the outer surface cool, and an extra tough, abrasion-resistant cover and you have a super-service, super-safe hose for superheated steam—Hy-Test steam hose! It's made to withstand working pressures up to 200 pounds.

Your local NYB&P Distributor can supply you with Hy-Test—and other superior quality steam hose for less severe service. Follow his advice for maximum hose value...with maximum safety!

NEW YORK BELTING & PACKING CO.

America's Oldest Manufacturer of Industrial Rubber Products

1 MARKET STREET—PASSAIC, NEW JERSEY

RS MATERIALS HANDLING

You expect more when you buy

Leadership

And you should. You've found that leadership implies *extra* dividends. Much better values. That's because a reputation for leadership is earned the hard way—by constant consideration of things beyond mere function and cost. Mostly, they are ideas . . . with *you* in mind. New ideas for better product use; new ideas on how to improve day-by-day performance; new construction ideas that extend the product's service life yet cut costs; and, always, new ideas for improving every branch of service to the customer. Some people call all this "creative manufacturing". Others talk about research . . . both product and market. But, call it what you will, you know that leadership is worth first consideration when you buy new equipment. In materials handling, too.

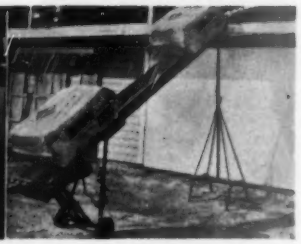
*T.M.

Rapistan®

PRESS-VEYOR* flows stampings, screw machine products and similar parts from machine to tote box or shipping carton.

TABLE-VEYOR*, horizontal power belt unit popular for assembly, inspection, checking, order packing operations.

FLOOR-VEYOR*, reversible power belt for inter-floor handling of any flat or semi-flat items.



LS ALUMINUM BELT CONVEYOR*, unusually light and versatile, highly maneuverable for job-to-job loading, stacking.

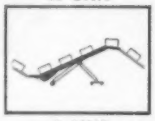
Do the job better... for less money

It's your constant problem. And ours, too. In conveyors, we believe the answer lies in standardization—so that you get more versatility in use and more dependability in service, at lower costs. Today, all Rapistan conveyor units, both power and gravity, may be used together in a wide range of economical combinations giving you substantial savings! In almost every industry, you'll find these Rapistan installations providing extremely effective, low cost solutions to innumerable types of handling problems.

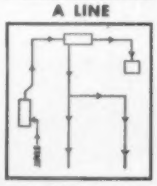
Some ideas on cost cutting

Rapistan's Aluminum Stevedore, Jr.* is a lightweight, mobile, powered unit. Here are just a few of the things this one unit will do: You'll find it highly efficient in stacking or loading; with equal facility, it can be used as a booster or speed control unit in a line of Rapid-Wheel* or Rapid-Roller* gravity sections; or it can be included in a complete flow system throughout your warehouse or plant. This is typical of the multi-purpose principle that helps you save money when you buy Rapistan. Such cost-saving versatility is basic in Rapistan's entire line of light, medium, and heavy-duty equipment. We'll gladly be specific—and show you how you can benefit by it.

A UNIT



A LINE



AN ENGINEERED SYSTEM

●

For complete details on all Rapistan equipment, ask for this illustrated catalog packed with ideas and suggestions for cutting handling costs.

Service when you want it... as you want it

Our guess is that you'd like dependable service before, during, and after installation of your handling equipment. That's why Rapistan has more than fifty sales-service agencies across the country. From the original survey of your needs, through installation and maintenance, you'll have the dependable supervision of factory-trained specialists. They'll tell you about lease plans, service contracts, and the many other Rapistan "extras". But, best of all, you'll find them on the spot with the service you want—when you want it.

Now, you can lease equipment

Recently, Rapistan startled the industry with a new idea—why not *lease* conveying equipment? Leasing allows you to fix your handling costs exactly, relieves capital for other investment purposes, cuts down on your bookkeeping of depreciation, insurance, maintenance and similar items, and it gives you a nice hedge against rising prices. You can use Rapistan's new lease plan whether you need a few conveyor units or a complete, engineered system. Full information is yours for the asking.

There's gold in these reports!

It's the "gold" of valuable experience contained in Rapistan Field Reports. There are many of them . . . some in your own industry . . . and they're authentic. Each report covers an actual materials handling problem as it existed, and the solution—with photos, plans, specifications, and equipment costs. You may have any you wish. Just indicate your interest on the coupon below. We'll send you the reports promptly—without charge or obligation.

YOURS FOR THE ASKING!

Complete Rapistan Field Reports on how materials handling problems similar to yours have been successfully solved by and for leaders in your own field.

Check reports below which will be of greatest benefit to you:

- ☐ Aircraft Parts
- ☐ Auto Supplies
- ☐ Beverages
- ☐ Building Supplies
- ☐ Canneries
- ☐ Chemicals
- ☐ Cosmetics
- ☐ Dairy Products
- ☐ Fabricated Metals
- ☐ Floor Coverings
- ☐ Food Products
- ☐ Freight Terminals
- ☐ Fruits, Vegetables
- ☐ Furniture
- ☐ Grain and Feeds
- ☐ Grain Milling
- ☐ Grocery Store
- ☐ Heating Equipment
- ☐ Household Appliances
- ☐ Laundry Services
- ☐ Leather Products
- ☐ Machine Parts
- ☐ Magazines, Newspapers
- ☐ Meat Packing
- ☐ Metal Stamping
- ☐ Paint Products
- ☐ Paper and Publishing
- ☐ Pharmaceuticals
- ☐ Power Tools
- ☐ Sugar Refining
- ☐ Tobacco Products
- ☐ Warehousing
- ☐ Waste Materials
- ☐ Wood Products

There are many other Rapistan Field Reports. If your business is not listed, please indicate your special needs below:

The RAPIDS-STANDARD COMPANY, Inc.
139 Rapistan Bldg., Grand Rapids 2, Mich.

Name

Company Name

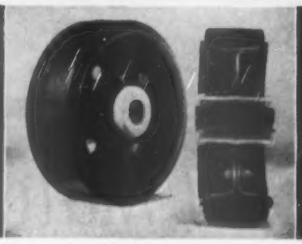
Street Address

City Zone

State

GIVES YOU MORE

RACK STORAGE with slightly pitched sections of Rapistan Rapid-Wheel gravity conveyor assures first-in-first-out inventory.



MB INDUSTRIAL WHEEL has demountable tire bonded to band of steel. Saves 30% on operating costs compared to molded-on type.

NEW 1.9 ROLLER CONVEYOR has 2500 lb. capacity for heavy industrial applications. Variety of lengths, widths.

COMPLETE LINE OF CASTERS, stamped steel, Cold Forged and Steel Forged for wide range of operating conditions.

COMPANY WINS

AM AMERICAN MUTUAL

Service from salaried representatives in 78 offices! Savings from regular substantial dividends!

$227,083 PRIZE!

(with new low score!)

By Mr. Friendly

Company:

The Acushnet Process Company of New Bedford, Mass., famous manufacturer of golf balls and molded rubber products.

Record:

They've played ball with American Mutual, and we've played ball with them for 17 pleasant, profitable years.

New low score:

We worked together to reduce the score of costly accidents to way below par for their field, and saved $188,271 through lower premiums in the past 8 years alone!

Additional prize:

They also saved $38,812 through dividends in 8 years.

Total winnings: $227,083.

Moral: If you're interested in a service that can help reduce accidents and premiums to record lows . . . and keep you out of dangerous traps and costly hazards, write American Mutual Liability Insurance Company for the complete case of The Acushnet Process Co. Address: Dept. F-50, 142 Berkeley St., Boston 16, Massachusetts.

© 1953 AMERICAN MUTUAL LIABILITY INSURANCE COMPANY

"We really saved money with *and our tenants*

says **R. L. Kaufman,** *Asst. to President*
J. B. Kaufman Realty Company

This outstanding window modernization job was done by W. J. Soukop, Inc., Bayside, L. I., N. Y.

these PC Glass Blocks, *liked them from the start"*

• It was an old, old story at the Kaufman Building in Long Island City, N. Y. The steel sash bulged out of line as much as 4 inches. Ventilators warped and they were often impossible to open or close. The thousands of small glass panes just *couldn't* be kept clean except at prohibitive cost.

Heat loss was high in the winter, the interiors were blazing hot in the summer and the twisted sash made the building look unsightly.

All that grief is gone, now. In Mr. Kaufman's words: "With these PC Glass Blocks, we've eliminated all our window troubles. Glass Blocks are no more expensive than steel sash because maintenance costs are so low. We have to clean them only twice a year. Window painting costs are sharply reduced. And in addition to that, we'll save approximately 15% on our heating and air conditioning costs. In the long run, we'll be money ahead. The building itself looks 100% better."

For more information on how you can have better daylighting, lower heating, air conditioning and maintenance costs, and a better-looking building in the bargain, return the coupon.

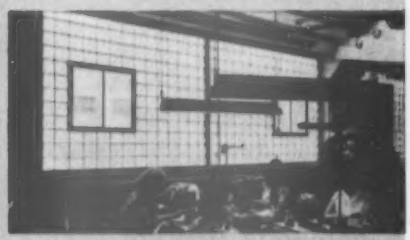
Pittsburgh Corning Corporation

PITTSBURGH 22, PA.

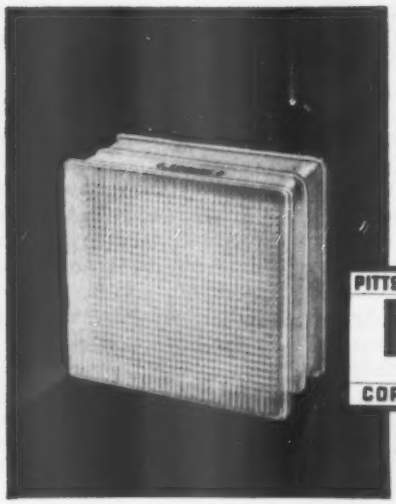
READ WHAT THE KAUFMAN BUILDING TENANTS SAY ABOUT PC GLASS BLOCKS:

MANUFACTURER: "The PC Glass Blocks give excellent light in our plant area. In the machine shop, men have critical visual tasks. These glass blocks make their jobs easier."—George A. Loeb, Vice-President, General Register Corp., world's largest manufacturer of admission control systems.

LITHOGRAPHER: "We have nothing but praise for these PC Glass Blocks. There are no more drafts, no more dirt. The change in appearance is terrific."—George C. Kindred, President, Kindred-MacLean Co., Inc., one of New York City's largest lithographers.



KNITTING MILL: "We liked the PC Glass Blocks right from the start. They look fine, and the improved natural lighting saves a lot of money on our electricity bills."—Bernett Levitt, Secretary, Cropper Knitting Mills, Inc.



Here's what you get with PC Glass Blocks

- **BETTER DAYLIGHTING**—Functional patterns direct daylight to reflective ceiling, or distribute it uniformly throughout the room. More light, less glare.
- **REDUCED HEATING & COOLING COSTS**—Glass block panels have insulating efficiency of a solid 8-inch masonry wall.
- **LOWER WINDOW MAINTENANCE COSTS**—Glass block panels seldom have to be washed. Breakage is rare, and there is nothing to paint.
- **NO "EXTRA" EXPENSES**—Unlike convention l windows, panels of PC Functional Glass Blocks seldom if ever need expensive shades, blinds or louvres.
- **NO DIRT INFILTRATION**—A glass block panel is an integral part of your building wall. Tight mortar joints seal out moisture, dirt.
- **LESS OUTSIDE NOISE**—PC Glass Blocks are hollow. The dead air spaces reduce sound transmission.

PITTSBURGH PC CORNING ®

Pittsburgh Corning Corporation
Dept. N-103, Pittsburgh 22, Pa.

Please send me a FREE copy of your booklet, "PC Glass Blocks—The Mark of a Modern Building."

☐ Send engineer to discuss specific problem. ☐ Advise nearest source of supply.

NAME ..... TITLE .....

FIRM .....

ADDRESS .....

CITY ..... ZONE ..... STATE .....

LUBRIPLATE No 630-AA IS PRACTICALLY A UNIVERSAL LUBRICANT

—says

THE SPOKANE PORTLAND CEMENT CO.

"With the introduction of LUBRIPLATE No. 630-AA, we were able to satisfy all our needs for solid type lubricants with only two LUBRIPLATE Products. LUBRIPLATE No. 630-AA might almost be considered a universal lubricant. Furthermore, it has effected marked savings in both lubricants and labor!"

For nearest LUBRIPLATE distributor, see Classified Telephone Directory. Send for free 56-page "LUBRIPLATE DATA BOOK"... a valuable treatise on lubrication. Write LUBRIPLATE DIVISION, Fiske Brothers Refining Co., Newark 5, N. J. or Toledo 5, Ohio.

REGARDLESS OF THE SIZE AND TYPE OF YOUR MACHINERY, LUBRIPLATE LUBRICANTS WILL IMPROVE ITS OPERATION AND REDUCE MAINTENANCE COSTS.

Begins on page 113

OPERATIONS RESEARCH

Glossary of terms you'll be hearing—and using

Conceptual Model (See Model)

Correlation · Relating one factor to another to find out how much of the relationship is due to chance. Correlation is expressed as a decimal between zero and one. A correlation of one would mean that none of the relationship was due to chance—a direct relationship. A correlation of zero would mean that all the relationship was due to chance—no relationship at all.

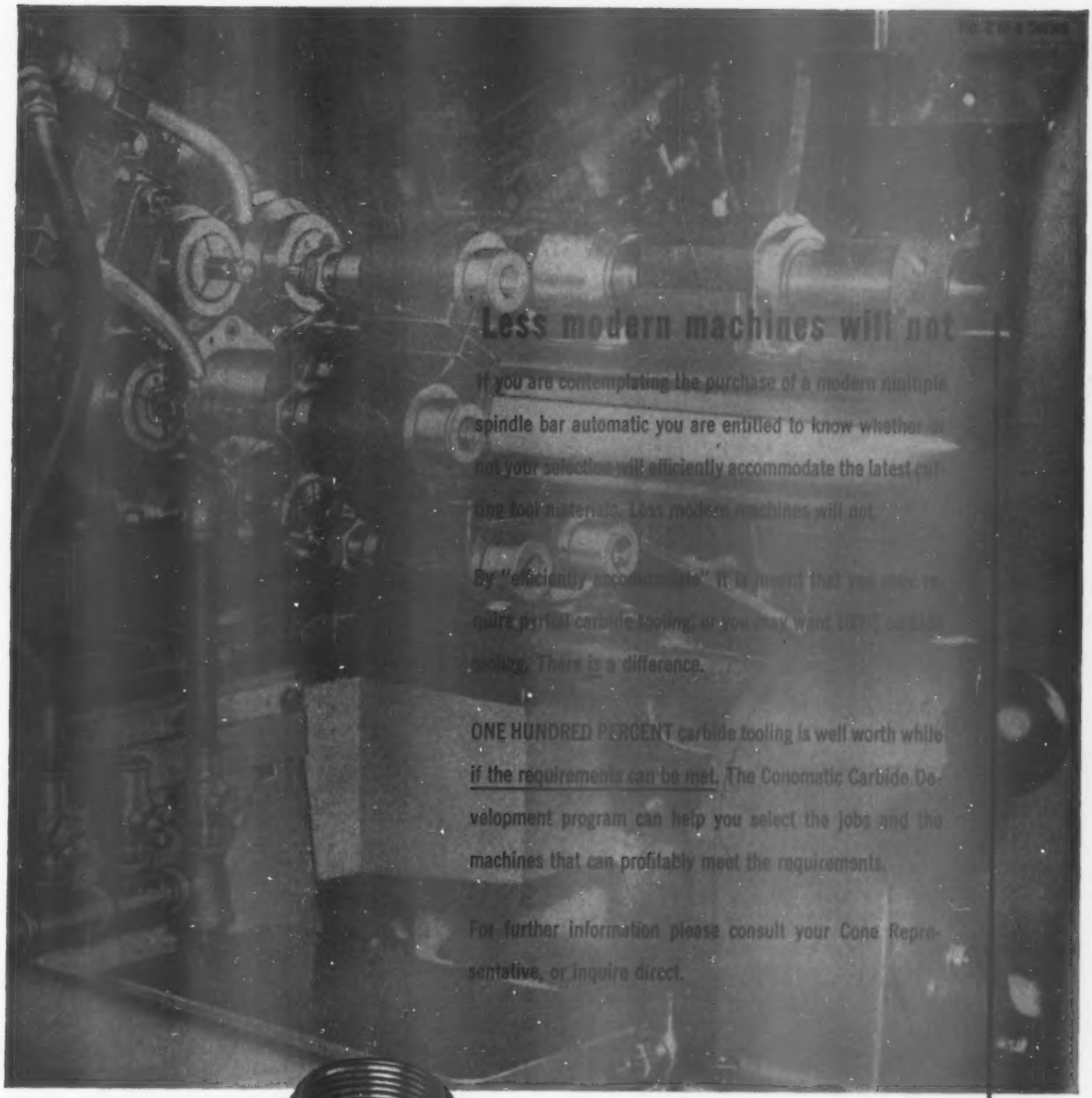
Econometrics · Mathematics and statistics applied to economic problems. Mathematical models of economic situations are manipulated to see what the economic effects of changing variables will be.

Frame of Reference · Talking about the same thing or speaking in the same terms. Refers to the mathematical base from which values are taken. For example, labor costs will vary throughout your plant. In order to use labor costs as a frame of reference, you would have to convert all labor costs to a standard labor cost for the plant — departmental labor costs would then be percentages of this.

Game Theory · New science based on probability rules to determine ways to play against an opponent so as to minimize your possibilities of losing. So far applied mostly to simple games against one opponent. One of the accepted rules is: If you are playing a game where each turn involves only two choices (like guessing heads or tails in coin matching), your best strategy is to play the game completely at random. That way you minimize your possibility of losing and should win fifty per cent of the time—no matter what strategy your opponent uses. Some scientists think that when this science "grows up" it will offer some useful rules for "outguessing" competition.

Implementation · Doing the things that have to be done to put an idea to work. In operations research this may be testing a theory, developing a simple procedure for workers to use in routine work, or filling in the details to make a plan feasible. Work done in areas related to a particular problem to provide better over-all results may also be defined as implementation.

Input-Output · Method for determining relationship of various factors to one another. Developed for demonstrating inter-industry dependencies—to show what orders for key products take in the way of finished goods and materials from other industries. Input-output means that all industries have materials and finished products coming in from other industries, and materials and finished products leaving. This method demonstrates the



Less modern machines will not

If you are contemplating the purchase of a modern multiple spindle bar automatic you are entitled to know whether or not your selection will efficiently accommodate the latest cutting tool materials. Less modern machines will not.

By "efficiently accommodate" it is meant that you may require partial carbide tooling, or you may want 100% carbide tooling. There is a difference.

ONE HUNDRED PERCENT carbide tooling is well worth while if the requirements can be met. The Conomatic Carbide Development program can help you select the jobs and the machines that can profitably meet the requirements.

For further information please consult your Cone Representative, or inquire direct.

MATERIAL—1040 STEEL

	HSS	CARBIDE
Cycle Time	*	30 secs.
Work Spindle Speed	*	670 R.P.M. at 160 S.F.
Tool Wear	*	2000 pcs. per grind

*Hot rolled material prevents fair comparison

Conomatic }

CONE AUTOMATIC MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.

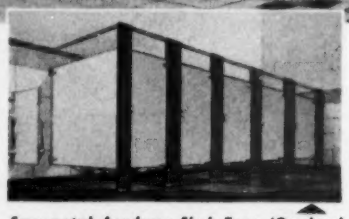
Sanymetal*...

*Trade Mark Reg. U. S. Pat. Off.

can help reduce maintenance costs to an all-time low!

Sanymetal Academy Flush Type Shower Stalls provide suitable shower facilities for all types of industrial plant shower installations. This is just one of several types of Sanymetal Shower Stalls, all of which are available in Vitreous Porcelain on Steel, the ageless and fadeless material, or "Tenac" —synthetic enamel baked on over Galvanized, Bonderized* Steel. (*Treated with "Bonderite", a product of the Parker Rust Proof Company).

Sanymetal Century Type Ceiling Hung Toilet Compartments are particularly appropriate for industrial rest rooms. When combined with wall-type plumbing fixtures the cost of day-to-day maintenance can be reduced to an all-time low because there is nothing to interfere with the floor cleaning procedure.



Sanymetal Academy Flush Type (Overhead Brace) Toilet Compartments are the most popular floor suported type toilet compartments for industrial installations. This type makes a strong, sound, distinctive installation and is suitable for remodeling purposes.

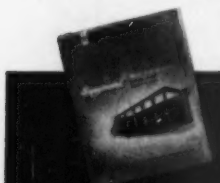
Yes, reduce maintenance cost at the rest room and shower room level. Modernize your rest room and shower room facilities, and you'll get another plus—a reduction of lost time and production scrap. Sanymetal offers several types of toilet compartments and shower stalls suitable for different types of industrial buildings. Usually your present plumbing fixtures, toilet bowls and wash bowls need not be disturbed, unless relocation or additional rest room facilities are necessary. It's easy to improve a rest room environment and to modernize shower facilities. Sanymetal "Porcena" (Vitreous Porcelain on Steel) Toilet Compartments and Shower Stalls lift sanitation to an all-time high and give longer years of service than any other material. Sanymetal "Porcena" (Vitreous Porcelain on Steel) is a material that is glass-smooth, rust-proof, impervious to odors, ordinary acids, oils and grease. Finished in fadeless colors imbedded deep into a flint-hard surface that discourages scratches and defacement yet is easily and quickly cleaned. There is no other material that equals it!

Check up on the condition of your rest room and shower room facilities with an eye to modernization where it pays off in reducing non-productive time costs. Then ask the Sanymetal Representative in your locality for helpful suggestions.

Sanymetal Toilet Compartments and Shower Stalls embody the results of over 39 years of specialized skill and experience in making over 500,000 toilet compartment and shower stall installations. Write for Catalog No. 90 which offers ideas for reducing maintenance and non-productive time costs.

THE SANYMETAL PRODUCTS CO., INC.

1707 Urbana Road • Cleveland 12, Ohio



Write for Catalog No. 90 which offers ideas for reducing non-productive time costs.

THE SANYMETAL PRODUCTS CO., INC. • 1707 Urbana Road, Cleveland 12, Ohio

We are interested in ideas for reducing non-productive time costs and day-to-day maintenance costs of rest room and shower room facilities. Please send Catalog No. 90 promptly.

Name .....

Position .....

Company .....

Street ..... City and State .....

Please attach coupon to your business letterhead.

OPERATIONS RESEARCH GLOSSARY . . . *Begins on page 238*

effects of various changes on all industries concerned. Many plant problems consist of a number of interrelated factors that could be analyzed by this method.

Linear Programing • Similar to input-output in that a lot of interdependent factors can be related—but linear programing tries to relate them in some optimum fashion. (Or set up a program of values that will give the best results.) For example, scheduling many production orders on several machines to obtain the fewest number of total hours of machining time.

Measure Of Effectiveness • Evaluating how close to the right answer you are. Determining probable errors and impact of results. The means by which you can tell how effective results will be—for instance, hours lost through plant accidents is a measure of the effectiveness of your safety program. Operations research may develop an elaborate formula to measure the effectiveness of results in a complex situation.

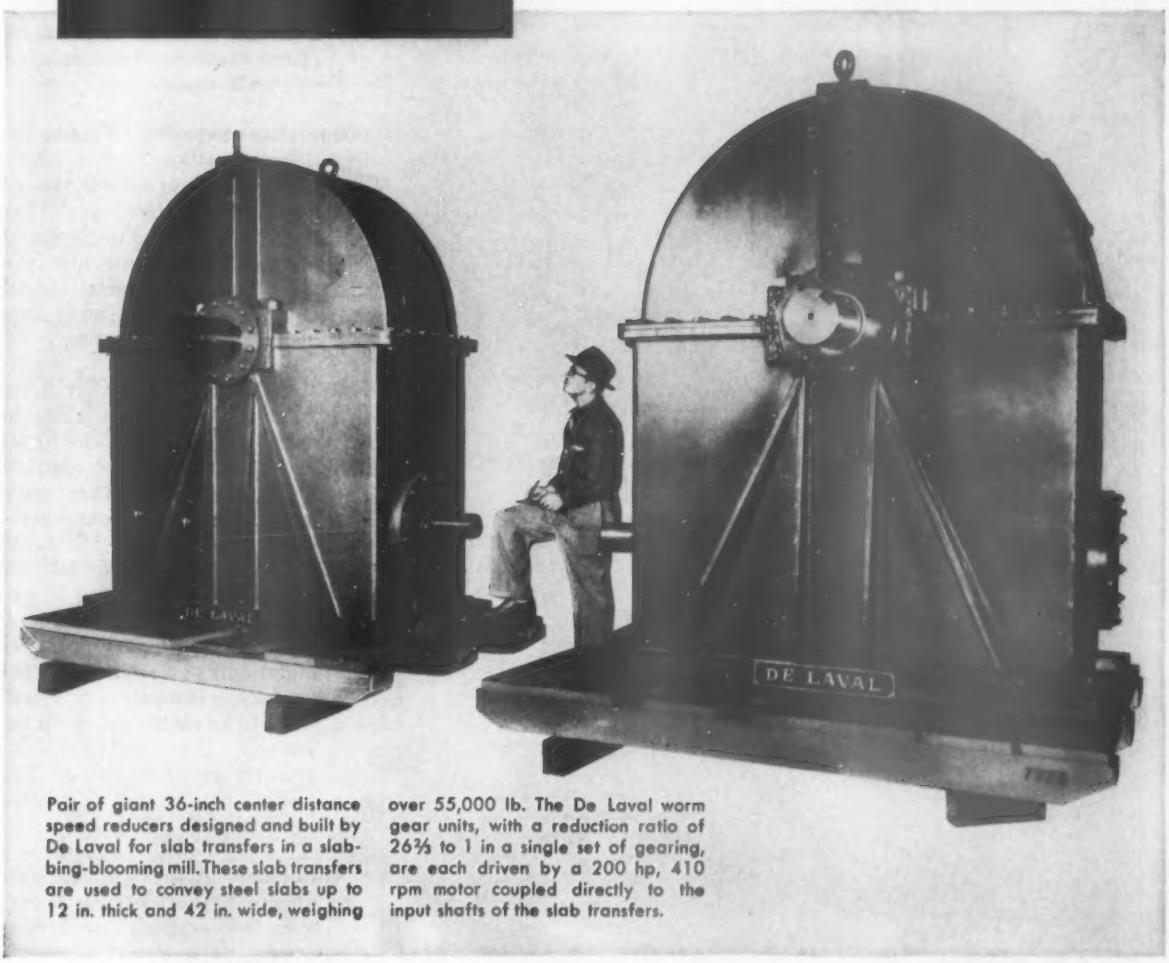
Minimax • Solving problems so as to minimize the maximum possible loss. Following a course of action that would minimize ill effects caused by wrong predictions or by circumstances over which you have no control.

Model (sometimes called conceptual model) • An equation or group of equations that describes mathematically a real situation. It relates factors involved so they can be operated on mathematically.

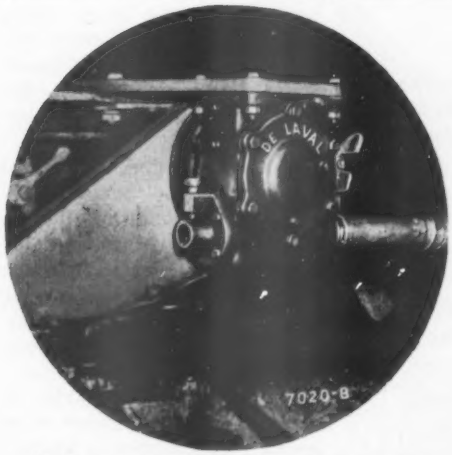
Monte Carlo Method • A technique for predicting results based on random sampling rather than on a mathematical

DE LAVAL
SPEED REDUCERS

from dwarf to giant size



Pair of giant 36-inch center distance speed reducers designed and built by De Laval for slab transfers in a slabbing-blooming mill. These slab transfers are used to convey steel slabs up to 12 in. thick and 42 in. wide, weighing over 55,000 lb. The De Laval worm gear units, with a reduction ratio of 26⅔ to 1 in a single set of gearing, are each driven by a 200 hp, 410 rpm motor coupled directly to the input shafts of the slab transfers.



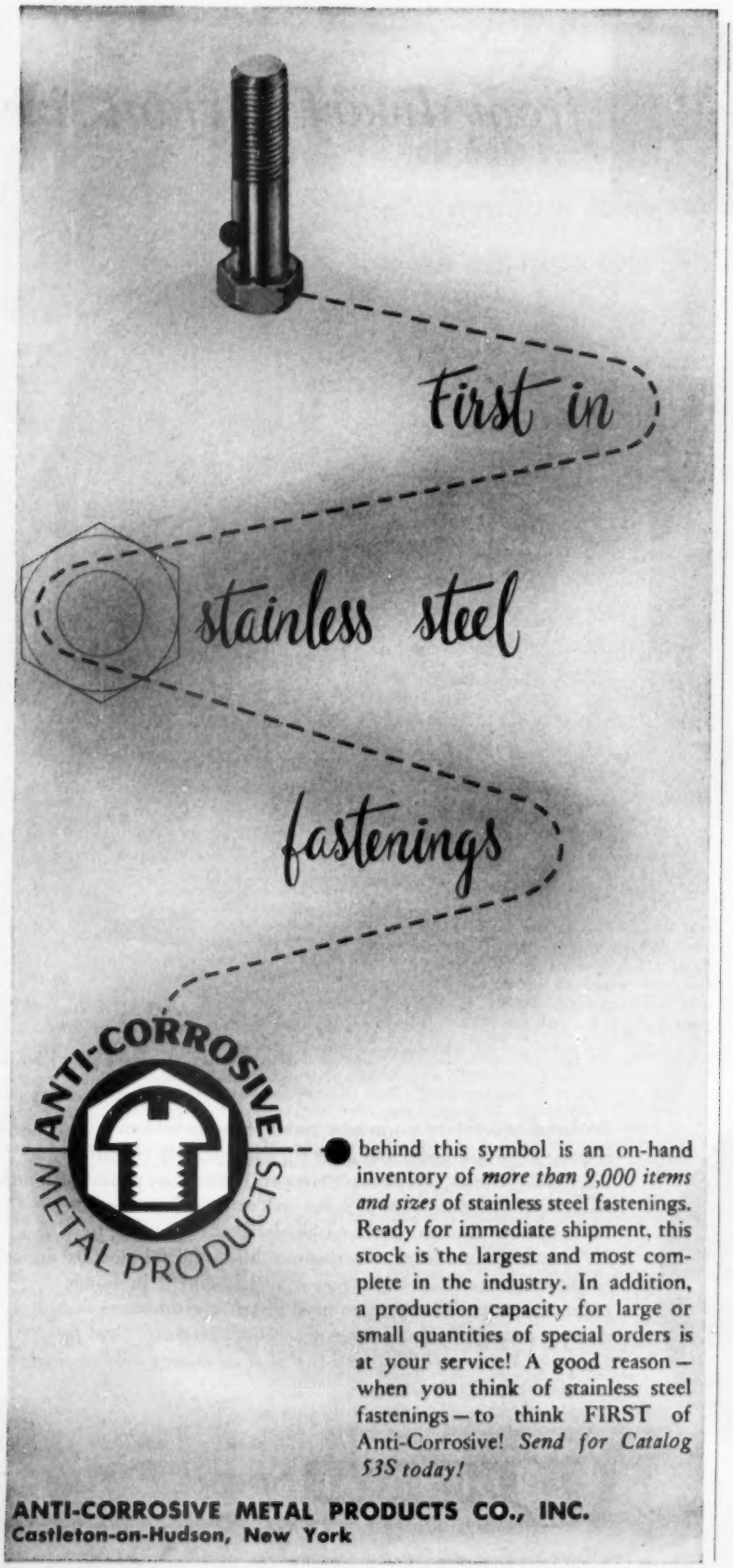
Here's one of the smaller De Laval worm gear speed reducers with a 3″ center distance being used for a new coal drilling machine.

De Laval heavy-duty worm gear speed reducers seldom require attention under the most rugged operating conditions. They make a quiet, close-couple compact drive. They permit high ratio reductions in a minimum of space and withstand severe shock loads without damage. De Laval builds all sizes from 3″ to 36″ center distances for transmission ratios of 3.1:1 to 100:1 in single reduction units and ratios of 50:1 to 8000:1 in double reduction units. Whether you need dwarf or giant worm gearing, consult De Laval for engineering assistance. *Send for De Laval Manuals G-WBV and G-WWH containing data on single and double reduction units.*

DE LAVAL *Speed Reducers*

DE LAVAL STEAM TURBINE COMPANY

804 Nottingham Way, Trenton 2, New Jersey DLS10



behind this symbol is an on-hand inventory of *more than 9,000 items and sizes* of stainless steel fastenings. Ready for immediate shipment, this stock is the largest and most complete in the industry. In addition, a production capacity for large or small quantities of special orders is at your service! A good reason — when you think of stainless steel fastenings — to think FIRST of Anti-Corrosive! *Send for Catalog 53S today!*

ANTI-CORROSIVE METAL PRODUCTS CO., INC.
Castleton-on-Hudson, New York

OPERATIONS RESEARCH GLOSSARY . . .

Begins on page 238

model. Results are obtained from lots of simple calculations rather than from manipulating elaborate equations.

Operations Research • A name for the application of more scientific methods to the solution of management problems. Involves broadening the scope of individual problems and the use of more mathematics. All in all, it's really a sharper kind of industrial engineering.

Optimalization • Determining what to do with variables in order to achieve a desired goal —which may be the greatest dollar saving, minimum hours, or maximum return on investment. Answer may not be to maximize or minimize the variables themselves. For example, you may not be able to make the maximum profit by maintaining a minimum inventory — instead, you will want to know the optimum inventory that will lead to greatest profit potential. This would be optimalizing your inventory.

Parameter • A factor or variable affecting a process or operation. For example, production costs of parts would depend on parameters like labor costs, material costs, and overhead. Cost of producing a particular part would depend on the value of each cost parameter.

Probabilistic • Having the feature of uncertainty—chance occurrence. Any condition that is made up of uncontrollable events, like the order in which workers arrive in the morning, machine breakdowns, or demand for parts or services. Here a single event is unpredictable, but the behavior of a group can be predicted when enough information is known.

Turn the page

Customer Reports:

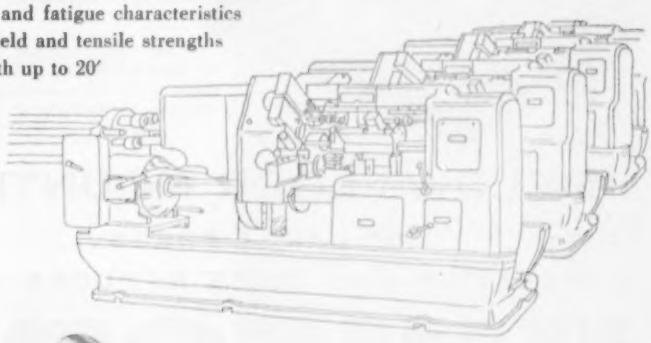
Asarco Continuous-Cast Bronzes Machined at Over 1,000 Feet Per Minute

WORTHINGTON CORPORATION has jumped machining speeds on shaft bushings and pump sleeves by using ASARCO Continuous-Cast Bronzes instead of foundry-cast bronzes. In some cases over 1,000 surface feet are machined per minute.

Worthington has used very substantial quantities of ASARCO Continuous-Cast Bronzes during the last three years in a variety of alloys and sizes. Tool life is longer despite high cutting speeds. Products are improved because ASARCO stock has greater uniformity than conventional foundry products, and its even dispersion of lead particles provides superior bearing surfaces.

ASARCO Continuous-Cast Bronzes are entirely free from porosity, and from hard and soft spots . . . are ideal for use on automatic screw machines. No sand, dirt, dross or other foreign matter is trapped in the stock to harm tools or discourage high cutting speeds. Dimensions are so precise that many machining operations are eliminated and waste is at a minimum. Impact and fatigue characteristics are up to 100% better than those of sand-cast bronzes. Yield and tensile strengths are superior, too. Stock is available in any length up to 20′ to meet individual requirements.

REDUCE MACHINING TIME! . . . IMPROVE PRODUCTS! . . . CUT SCRAP LOSSES! Buy ASARCO Continuous-Cast Bronzes and get bronzes with superior properties in the exact sizes you need.



ASARCO CONTINUOUS-CAST RODS · TUBES · SHAPES ®

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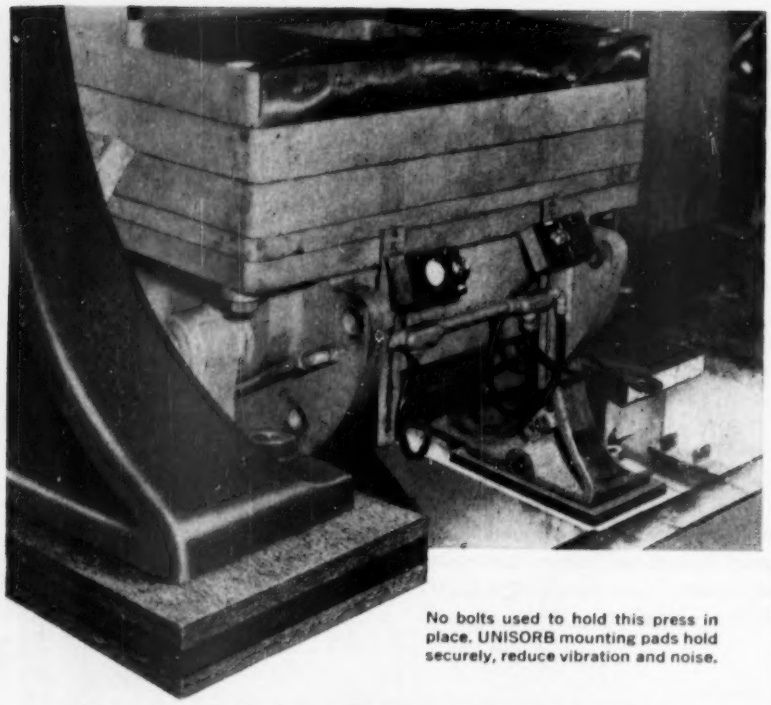
OFFICES: Perth Amboy Plant, Barber, New Jersey
Whiting, Indiana



No bolts used to hold this press in place. UNISORB mounting pads hold securely, reduce vibration and noise.

BELOW-FLOOR MOUNTING

OF LARGE PRESS...

VIBRATION AND NOISE REDUCED WITH

UNISORB®

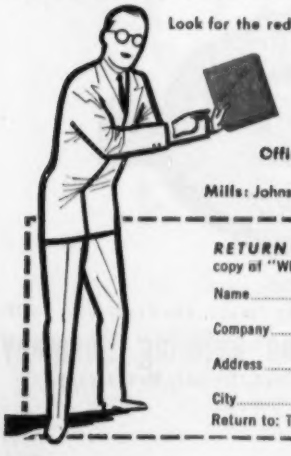
MOUNTING PADS

Studies in plant after plant, show that UNISORB mounting pads HOLD securely, even when used with gigantic machines.

And it's done without bolts, without costly floor drilling. You simply use the UNISORB pad recommended for the machine. Apply UNISORB cement, set the machine in place. Let the cement set and you're ready to roll.

The book about UNISORB tells the entire story, shows how easy it is to re-locate machines mounted the modern UNISORB way. For your free copy, return the coupon today.

UNISORB is also available pre-coated with adhesive, and is recommended for use only with machines that do not require shimming.



Look for the red center and UNISORB brand mark

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Offices: New York, Philadelphia, Chicago, Detroit, St. Louis

Sales Representative: San Francisco

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RETURN COUPON NOW! At no obligation to me, please send a copy of "Why It Pays to Anchor Machines with UNISORB."

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(Please Print)

Company .....

Address .....

City ..... Zone ..... State .....

Return to: The Felters Co., 206 South St., Boston

OPERATIONS RESEARCH GLOSSARY

. . . *Begins on page 238*

Quantifying · Putting numbers on intangibles. Expressing variables or factors that affect a process or operation in numerical terms—or relating them mathematically.

Queuing Theory (Waiting Line Theory) · Theories used to determine probability of bottlenecks occurring and to show what the effect of changes in service would be on the size of resulting waiting lines.

Regression · Similar to correlation, but goes further. A measure of how much relationship exists between variables and also the nature of the relationship. Shows the effect of one variable on another.

Stochastic · Processes with random variables, where the results are affected by conditions such as time. For example, the diameter of parts machined on a lathe might first vary in a random way according to a standard distribution about some average value. As cutting tools wear, the average value will shift. This makes it a stochastic process and difficult to analyze mathematically. Many processes that are really stochastic can be considered as non-stochastic when the effects due to time are relatively insignificant. This makes mathematical analysis easier.

Symbolic logic · Intuitive, generalized reasoning and analysis. Unmathematical in nature but often serves as a basis for mathematical analysis by placing logical restrictions on variables — defines problems or factors that effect a situation. Usually uses letters or symbols to describe the relations or restrictions of a real situation.

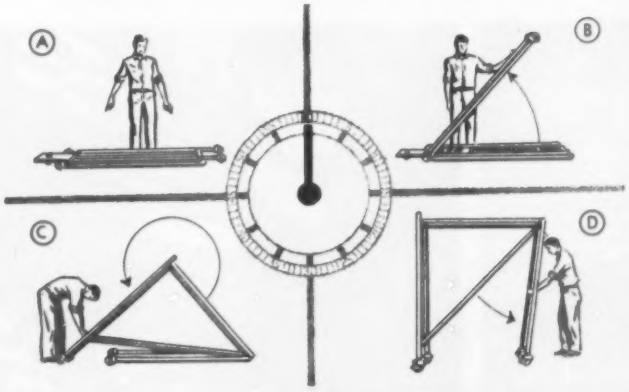
Waiting Line Theory (See Queuing Theory)

"WE SAVED 48 MAN-HOURS on the 90 man-hour job of steamcleaning, rewiring and painting an overhead crane at our South San Francisco plant," says Fred Reibin, Plant Engineer, Enterprise Division, General Metals Corp

25 ft. "UP-RIGHT" SCAFFOLD-ON-WHEELS

Set up in only 5 minutes!

As if by magic, an aluminum alloy tower of any height desired is ready in minutes! Individual scaffold sections are set one on top of the other. Sections lock into place instantly. The tower rolls down aisles . . . straddles machinery.



HERE'S THE SECRET!...

Patented ONE-PIECE SECTIONS

Each one-piece section is unfolded by one man in less than a minute! No tools, wing nuts or bolts.

Your maintenance costs can be reduced by **"UP-RIGHT" SCAFFOLDS**

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"UP-RIGHT" SCAFFOLDS

DEPT. 104 • 1013 PARDEE ST. • BERKELEY, CAL.

OFFICES IN ALL PRINCIPAL CITIES

FACTORIES: BERKELEY, CALIFORNIA & TETERBORO, NEW JERSEY

Genuine Westinghouse Renewal Parts Warehouses in your area enable you to keep low parts inventories on hand. With our fast and efficient ordering system you need to keep on hand only those parts most frequently needed for fast repairs.

Modern Westinghouse Repair Plants like this one are located close to you. These plants are well-equipped, ready to repair your Westinghouse apparatus at a moment's notice. This service by Westinghouse craftsmen cuts your repair time and costs.

Apparatus repairs require highly skilled craftsmen. These Westinghouse engineers working out of our Field Offices can give you top-quality, on-the-job repairs. Westinghouse engineers are trained to catch trouble before it starts.

How Westinghouse maintenance reduces inventories . . . cuts repair time and costs

Westinghouse offers you a well-planned and compact maintenance service that gives you complete service protection for your electrical apparatus.

1. Genuine Westinghouse Renewal Parts are designed specifically for Westinghouse apparatus. These parts embody the latest engineering advances that give you a better part—often better than the one designed for the original equipment. Westinghouse parts are precision built on the same machines that turn out parts for new apparatus designs. This assures you that the new part you are replacing is *no* imitation that wears out quickly—but a part that has exactly the tolerance, size, and quality you need for dependable operation.

Strategically located Westinghouse Renewal Parts Warehouses enable you to keep your parts inventories *low* . . . eliminates the need for overstocking. This gives you definite savings in cost, time, and stocking space.

2. 36 Repair Shops throughout the country give you substantial savings by repairing your Westinghouse equipment right the first time. Your apparatus is repaired in these shops with Genuine Renewal Parts with the same craftsmanship that goes into modern Westinghouse apparatus. Why not avail yourself of these facilities and "know-how."

3. When your equipment cannot be moved, on-the-spot repairs can be made in your own plant through our field service facilities. Experienced apparatus engineers, working out of these offices, can save you time and money, because they have been expertly trained to inspect and repair Westinghouse equipment. By utilizing this field service you will catch potential trouble early, thus, protecting your production output and eliminating costly repair bills. Westinghouse Electric Corporation, Maintenance Sales Dept., East Pittsburgh, Pennsylvania. J-95164

YOU CAN BE SURE...IF IT'S Westinghouse

How Do YOU Score on

How do the drives from the power source on the equipment in your plant score in this "driving" test?

	YES	NO
1. Do they transmit power positively and efficiently without costly slippage?	☐	☐
2. Do they assure positive, precise timing of machine operations . . . constant maintenance of speed ratios?	☐	☐
3. Do they have maximum shock absorbing ability?	☐	☐
4. Do they require only infrequent, low-cost, easy maintenance?	☐	☐
5. Are they compact . . . do they transmit large horsepower in limited space?	☐	☐
6. Are they sturdy and reliable . . . do not fail suddenly . . . will take abuse in emergencies?	☐	☐
7. Can they be lubricated for long life . . . are not affected by oil or grease?	☐	☐
8. Are they not affected by static electricity . . . free from fire hazard caused by overheating?	☐	☐
9. Are they the quietest medium obtainable in operation . . . free from vibration?	☐	☐
10. Are they simple to install and replace?	☐	☐
11. Are they long lived . . . of all-metal construction?	☐	☐
12. Do they allow for variations in shaft setting?	☐	☐
13. Are they free from pre-loads that shorten shaft bearing life?	☐	☐
14. Are they free from power loss, regardless of adjustment?	☐	☐

To find out how your drives rate, see opposite page.

This "Driving" Test?

Score seven points for every "Yes" answer. How did your drives make out? If you scored from 84 to 98 points, your drives are excellent, you're using the best drives for your equipment.

You're using chain drives.

If you scored from 64 to 83 points, your drives are probably in good shape, but you'd better check them over for possible improvements in chain application.

If you're using any other power transmission medium, you can't possibly score more than 63 points. Isn't that good evidence that your best bet for lower cost power transmission . . . greatest flexibility . . . greatest efficiency and dependability . . . *is chain.*

And, for the best in chain, choose from the complete Chain Belt Company line of Rex® and Baldwin-Rex® Chains. More than 2000 sizes and types offer you the greatest range of selection . . . permit you to pick the exact size and type that will best fit your requirements.

For lower cost . . . for greatest efficiency . . . for top quality . . . for best overall results from your equipment . . . specify *chain* . . . from the complete Chain Belt Company line.

For assistance in selection and application of chain for your drives and conveyors, for best overall results, call your Chain Belt Field Sales Engineer. He's ready, willing and able to help you.

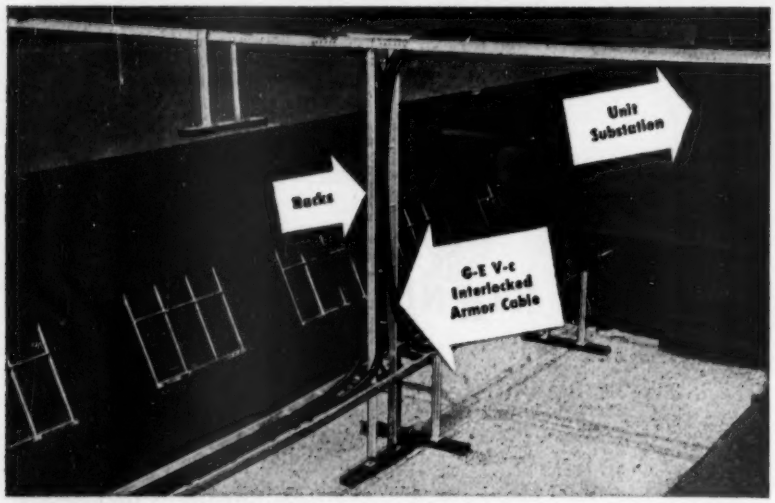
In addition, a large list of helpful literature is available for the asking. Here is a partial list of titles which may be of interest to you:

Care and Maintenance of Chains—Rex Lumber Mill Chains—Rex TableTop Chains—Rex Chains for Cement and Rock Products Industries—Rex and Baldwin-Rex Conveyor Chains and Attachments—Baldwin-Rex "BA" Riveted Roller Chain—Baldwin-Rex Stock Roller Chains—Baldwin-Rex Flexible Couplings—Baldwin-Rex Tension Linkages—Baldwin-Rex Double-Pitch Roller Chains—Unusual Applications of Roller Chain. *Send for any or all of these booklets today.* Chain Belt Company, 4667 West Greenfield Ave., Milwaukee 4, Wis.

REX BALDWIN-REX

Chain Belt COMPANY OF MILWAUKEE

Broken roof lines present no problem for the G-E V-c interlocked armor cable system



The G-E V-c interlocked armor cable system can be quickly installed by utilizing existing structures. This feature saves time and has helped many plants to maintain production during installation.

Installation speed important feature

To distribute power in a modernized plant, an eastern manufacturer used 12 G-E unit substations on the roof and then installed a G-E V-c interlocked armor cable system to bring high-voltage power to these substations. More than a mile of G-E V-c interlocked armor cable was used. The cable was 3-conductor #2/0, 15,000-volt, No. 1799 varnished-cambric-insulated with an over-all thermoplastic jacket and bronze armor.

Easier installation

The uneven contour of the buildings' roofs made an ordinary conduit installation extremely difficult. And underground duct work would have meant costly tearing up of concrete floors. Either of these methods also meant more installation time and more cost for materials.

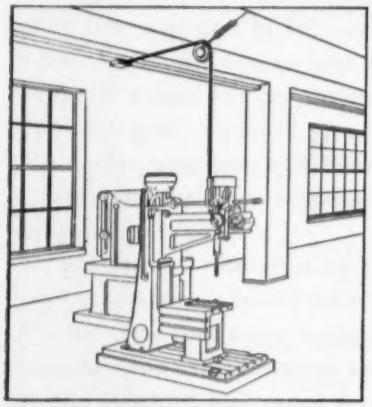
Racks used

Aluminum racks, only 12 inches wide, were used to carry the cable over the many rises, slopes, and bends on the roofs. Because the G-E V-c interlocked armor cable system is light and flexible, no difficulty was experienced in pulling long lengths by hand.

Readily available

G-E V-c interlocked armor cable on racks is always open for visual inspection — always accessible — quickly spliced with simple, mechanical joints. To our knowledge, no installation of G-E V-c interlocked armor cable has ever suffered mechanical damage sufficient to cause electrical failure.

• For fast connections to plug-in type overhead buses



G-E Flamenol* bus-drop cable provides a fast, easy way to connect machine tools to low-voltage, overhead, plug-in type distribution buses. No conduit is needed. The cable is inserted into inexpensive watertight connectors at the bus and at the machine tool switchboard, and is supported by a cable loop as shown at the left.

The insulation and jacket on Flamenol bus-drop cable resist oil, grease, gasoline, acids, and alkali cutting fluids. This cable withstands severe mechanical abuse, and will not support combustion.

G-E Super Coronol cable passes 5½ year, 121 C test

Aging tests of G-E Super Coronol* cable held continuously under load at 121 C copper temperature have passed the 5½-year mark. This remarkable cable shows no sign of deterioration with both physical and electrical properties remaining stable after the 20th month. The tests are continuing and have enabled G. E. to raise the maximum rating of Super Coronol cable to 85 C copper temperature up to 8000 volts—80 C above 8000 volts.

HOW TO CHOOSE HEAT-RESISTANT WIRE AND CABLE

G. E. has prepared a useful booklet as an aid in the selection of Deltabeston* power cables, Types AVA, AVB, AVL. The booklet is free — Pub. No. 19-269-1.

*Registered Trade-mark General Electric Company

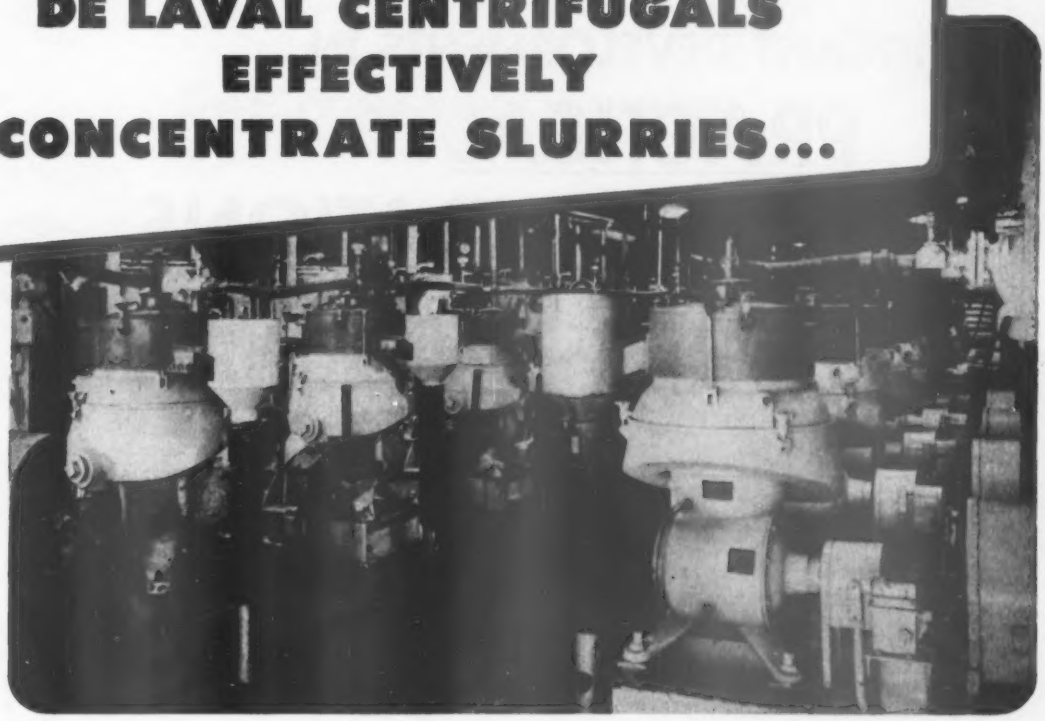
The next time you have a question on cable, call a G-E wire and cable specialist for prompt, expert help. You can reach him at the nearest G-E Construction Materials district office. Or, write Section W76-1034, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

You can put your confidence in—

1878 75 1953 YEARS OF ELECTRICAL PROGRESS

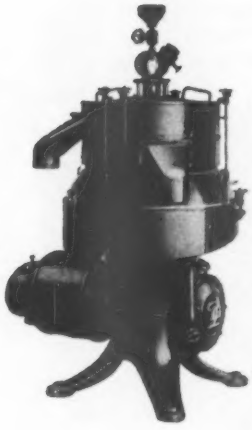
GENERAL ELECTRIC

DE LAVAL CENTRIFUGALS EFFECTIVELY CONCENTRATE SLURRIES...



...These Are Dewatering Gluten

What Is Your Problem?



The concentration of gluten is very effectively done by means of De Laval Separators. Many slurries, in fact, respond to the separating action of centrifugal force when filters or gravity produce little or no effect. Moreover, the successful centrifuging of a mixture automatically means time saved, for the action of centrifugal force is continuous. Gluten is only one more example of a substance that can be thickened both quicker and better centrifugally.

In the past forty odd years, De Laval engineers have solved hundreds of separating and concentrating problems. Many such problems have been in a field where the machines have continued to operate successfully for years. Some have been tests made in the laboratory only—but these tests too, are valuable, for the products involved may closely resemble the product that *you* wish to separate, concentrate or clarify.

It may pay you well to consult a De Laval engineer. You may be able to put the collective knowledge of The De Laval Separator Company, which is available to you through him, to work for you.

THE DE LAVAL SEPARATOR COMPANY

Chicago POUGHKEEPSIE, N.Y. San Francisco

DE LAVAL FOR FASTER PROCESSING SYSTEMS

SIGNIFICANT DEVELOPMENTS IN PRACTICAL LABOR RELATIONS

TOLD IN BRIEF FOR BUSY FACTORY EXECUTIVES

By PAUL A. KING • Attorney, Bigelow-Sanford Carpet Company, Inc.
Member, New York Bar

BARGAIN WITH UNION ON RENT INCREASES. *That's what NLRB tells company that leased apartments to employees* . . . **page 252**

CAN'T ALWAYS FIRE SUPERVISORS. *Under some circumstances they receive protection under the NLRA* . . . . . **page 252**

HINT ABOUT NEXT YEAR'S VACATION POLICY. *Vacation provision prevents two-week plant shutdown* . . . . . **page 254**

ATTITUDE SURVEYS MUST AVOID UNION QUESTIONS. *NLRB rules that it is interference with employees' right to organize* . **page 254**

FEDERAL ANTI-BIAS LAW GETS FIRST TEETH. *But it's too early to tell what kind of bite will be put on employers who discriminate* **page 256**

NO "DIRTY NAMES" ON PICKET LINE. *Foul language ruins strikers' chance for reinstatement* . . . . . **page 256**

NEWLY-ELECTED UNION CAN GET NEW CONTRACT. *Right to new contract given by NLRB in first ruling on this point* . . **page 258**

BRIEF BUT IMPORTANT . . . *Pensions aren't peanuts . . . Reminder for election day (Nov. 3) . . . What makes up the cost of living? . . . Employment record . . . Have a subversive problem? . . . Minimum wage boost proposed again . . . "Unfairness" on the increase* **page 260**

Bargain With Union On Rent Increases

Here's one more "bargainable employee benefit" to add to the growing list: rental fees for company-owned employee housing.

The Lehigh Portland Cement Company announced rent increases for company - owned houses. About 25% of the company's employees lived in the houses. The National Labor Relations Board said that Lehigh had to bargain about the proposed increases. Reason? Low rents and convenient location resulted in "substantial advantages" to the tenants "which undoubtedly affected their conditions of employment."

But the housing must be advantageous to the employee. In another case, NLRB held rentals were not bargainable because employees and outsiders were treated on an equal-rent, first-come-first-served basis in company-owned apartments.

Can't Always Fire Supervisors

The supervisor gets very little protection under federal labor law. But sometimes it's enough to get you in trouble.

One company learned that it had committed an unfair labor practice when it fired two supervisors. It had ordered the supervisors to hamstring a union organizing campaign. The rank-and-filers knew of this order. The

Setol Cleanser HAS WHAT IT TAKES TO MACHINE-SCRUB OILY FLOORS—

Faster cleaning action!

Cuts operating time of the scrubbing machine

Finnell 213P Scrubber-Vac

Applies cleanser, scrubs, and picks up — in ONE operation!

Because *Setol* is specially compounded for the greater speed of *combination-machine-scrubbing*, it must *and does* work faster than average alkaline cleansers. *Setol* saponifies *and emulsifies* grimy oil and grease *instantaneously*. The wetting agent in *Setol floats the oil* for fast, easy, *and thorough* removal by the vac of a *combination machine* or with a separate vac unit. And because *Setol* stays fast-acting longer—does not spend its strength quickly as do ordinary oil and grease solvents — less is required to clean a given area. Thus *Setol* saves on materials and, by speeding the cleaning process, cuts operating time of the scrubbing machine . . . reduces labor costs . . . and saves on brushes. Best of all, *Setol gets floors oil-free clean!* Also acts as a disinfectant (contains pine oil), and leaves a pleasant, clean aroma.

- **A constant, fast-acting cleanser for machine-scrubbing cement, wood, wood block, metal, stone, and terrazzo floors**
- **Consistent use on cement floors prevents cement dusting . . . provides a finish that helps seal out waste materials**

For demonstration, consultation, or literature, phone or write nearest *Finnell Branch* or Finnell System, Inc., 2510 East Street, Elkhart, Indiana. Branch Offices in all principal cities of the United States and Canada.

FINNELL SYSTEM, INC.

Originators of Power Scrubbing and Polishing Machines

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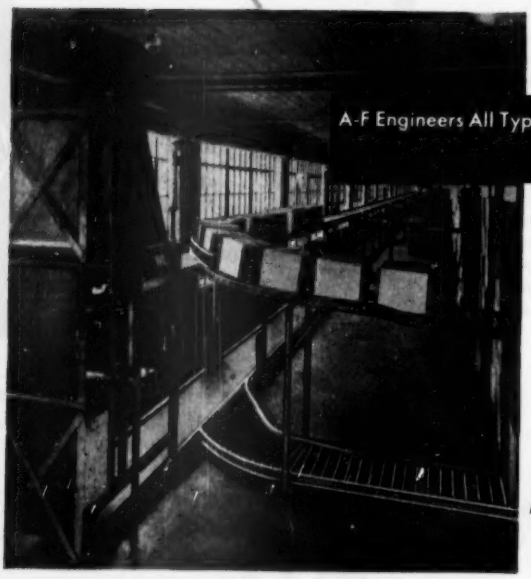


A-F You can SEE the Superiority of ALVEY-FERGUSON Conveyor Engineering

A-F For a discussion of latest efficient methods of handling products and materials write:

THE ALVEY-FERGUSON COMPANY

140 Disney St. REPRESENTATIVES IN PRINCIPAL CITIES Cincinnati 9, Ohio

PRACTICAL LABOR RELATIONS

Begins on page 252

supervisors were fired after the election put the union in.

The supervisors were protected not because they were supervisors but merely because the discharges had the effect of discouraging rank-and-file organization of unions. (*Talladega Cotton*)

Hint About Next Year's Vacation Policy

A two-week vacation shutdown may be a good idea for some companies—but before you adopt the practice, see if your contract with the union will allow it.

Servel, Inc., Evansville, Ind., announced it would shut its plant down for two weeks so employees could take their vacations. But it got stuck when an arbitrator agreed with the union that the vacation clause in the contract permitted employees to select their vacation periods.

The clause provided ". . . Each employee who is entitled to a vacation shall specify the vacation time he desires. So far as possible, vacations shall be granted at time specified by employees . . . but the final right to allot vacation periods is reserved to the foreman."

The company's argument was that its foremen decided employees could be spared only during the two weeks in August. The argument fell on deaf ears. The foreman's right must be exercized on an individual basis, reasoned the arbitrator.

Attitude Surveys Must Avoid Union Questions

Everyone knows he will be in hot water if he asks individual employees whether they want a union. But what's wrong with a secret poll on the subject? No

all 4 advantages you want

in a fluorescent lampholder...

exclusive with Benjamin...*yours at no extra cost!*

In a fluorescent lampholder, the four advantages you want most... the four features that you would include were you designing a lampholder of your own... are *yours* with Benjamin "Springlox." Benjamin brings you this exclusive, patented advancement at no additional lighting equipment cost!

These four most-wanted features bring you everything you require of a fluorescent lampholder: longer life, better electrical contact, speedier relamping and all-around simpler, quicker, safer lighting maintenance.

You get these four most-wanted features exclusively with Benjamin. They are yours as "standard equipment" with every Benjamin Industrial Fluorescent Lighting Unit, whether it uses two T12 lamps or three, bi-pin or single-pin lamps, for individual units or continuous line construction.

*Exclusive with all**
BENJAMIN FLUORESCENT UNITS

BENJAMIN "Springlox" lampholders

sold exclusively through electrical distributors

1 "Built to take it" RUGGEDNESS Practically indestructible ALL-METAL construction. NO BREAKAGE... no out-of-service time due to socket failure. Lamps CUSHIONED against shock and vibration.

2 SAFETY Whether installed in a steel mill or office, lamps cannot drop out or be shaken loose, because "Springlox" is SELF-ADJUSTING for slight differences in lamp length.

3 "Quick-in, quick-out" LAMP SERVICING Makes lamp servicing simpler for all T12 fluorescent lamps. "Finding ring" makes possible "ONE-HAND" lamp insertion of bi-pin lamps.

4 "Never-fail" ELECTRICAL CONTACT Never fails to make contact the *first time*. "Easy-make, easy-break" circuit switch built into single-pin type. Separate springs for electrical contact and locking compression.

Bi-pin type "Springlox" for 2 or 3 lamps

transparent view of "push end" shows how flexible spring base simplifies lamp insertion.

Single-pin type "Springlox" for 2 or 3 lamps

*"Springlox" lampholders are designed to accommodate all T12 Lamps for industrial use.

Send for **FREE "SPRINGLOX" DATA BULLETIN!** Tells you more about time and labor savings made possible by "Springlox"-equipped Benjamin Fluorescent Lighting Units. For your free copy, write: Benjamin Electric Mfg. Co., Dept. Des Plaines, Ill.

YLS680

DRY, FRESH AIR For a Supersonic WIND TUNNEL

● New and improved, this NIAGARA METHOD that effectively dries outdoor air for a wind tunnel used for testing at supersonic speed, can be trusted to give you the best air conditions for your purpose:

- to dry your materials or products
- to prevent condensation or moisture damage
- to protect your moisture-sensitive processes
- to give you an atmosphere in which your product can be packaged or stored safely.
- to give you exactly the right atmospheric conditions for testing materials
- to put "fresh air" back into your air conditioning, increasing its capacity and effectiveness

The Niagara "fresh air" Method removes the excess moisture from outdoor air by contact with an absorbent liquid in a spray chamber. The liquid contact temperature and the absorbent concentration, both controlled thermostatically, determine the amount of moisture in the conditioned air. Heating or cooling the air is a separate function. Therefore, you can easily and inexpensively have a precisely controlled condition without the use of moisture sensitive instruments.

The Niagara Absorbent Spray Method is noted for solving the really difficult problems of air conditioning. Write for complete information.

NIAGARA BLOWER COMPANY

Over 35 Years' Service in Industrial Air Engineering

Dept. F, 405 Lexington Ave. New York 17, N. Y.

Field Engineers in Principal Cities of U. S. and Canada

PRACTICAL LABOR RELATIONS

Begins on page 252

matter what the answer, you can't discriminate against individuals; you don't know who they are.

Nothing doing, says the National Labor Relations Board. It has just ruled that even a secret poll is unlawful interference with the employees' right to select a union. The way the Board looked at it, the poll was a form of coercion. The employees could fear retributive action. Besides which, said the Board, the secret poll was an assumption of the Board's powers. (*Protein Blenders, Inc.*)

Federal Anti-Bias Law Gets First Teeth

Plants with government contracts who are charged with discrimination because of race, creed, color, or national origin may find themselves called to Washington to explain their practices.

The special committee recently set up by President Eisenhower to make various recommendations as to the enforcement of anti-discrimination clauses in government contracts has one power that even a predecessor committee set up by Truman lacked:

"The committee may receive complaints of alleged violations" of the clause. Each complaint is to be referred to the appropriate government agency, and a report is to be made by it to the committee, indicating how it handled the grievance.

No "Dirty Names" on Picket Line

It may not be long before unions send their members to "finishing schools" to polish up the language they use on picket

"Save money? Sure!"

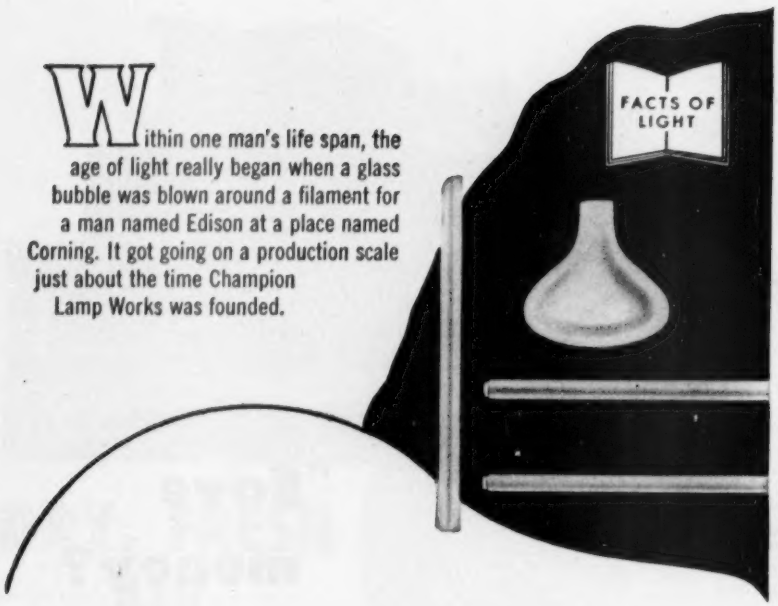
THAT, in a nutshell, tells you why so many wire rope users in the industrial fields prefer Roebling wire rope... it speeds up operations... lasts longer on the job... saves money that really adds up.

For the last word in wire rope efficiency and economy, call your nearest Roebling office or distributor for a Roebling recommendation.

ROEBLING CF&I
A subsidiary of The Colorado Fuel and Iron Corporation

JOHN A. ROEBLING'S SONS CORPORATION, TRENTON 2, N. J. BRANCHES: ATLANTA, 934 AVON AVE. • BOSTON, 51 SLEEPER ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 3253 FREDONIA AVE. • CLEVELAND, 13225 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. • NEW YORK, 19 RECTOR ST. • ODESSA, TEXAS, 1930 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST AVE. S. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, TRENTON 2, N. J.

Within one man's life span, the age of light really began when a glass bubble was blown around a filament for a man named Edison at a place named Corning. It got going on a production scale just about the time Champion Lamp Works was founded.



CHAMPION The glass of a *Champion*

Now, today's "ribbon" machine turns out a million incandescent bulbs a day to glass wall thickness tolerances of no more than .0075". Fluorescent tubes are blown and drawn to outside diameters not more than .038" from standard.

Glass for Champion Lamps is truly a marvel of modern chemistry and production control. It must be strong and resistant to the attack of water, chemicals, fumes, grit, wind and flame. It must keep Champion Lamps ready to light up at the flick of a switch — ready to perform like Champions.

May we mail you a copy of the new booklet C entitled CHAMPION QUALITY? It contains many interesting facts and illustrations.

CHAMPION LAMP WORKS
Lynn, Massachusetts
A DIVISION OF CONSOLIDATED ELECTRIC LAMP CO

PRACTICAL LABOR RELATIONS

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lines. That is, if the U. S. Court of Appeals decision made at Richmond sticks.

Employees on a picket line called employees who went to work such picturesque names as "scab, damn scab, trash, lowdown trash." There were other names, too—the kind you don't send through the U. S. mail. The employer refused to reinstate these striking employees—because of their "profane, obscene, and insulting epithets."

The National Labor Relations Board recognized the "industrial realities of speech in a work-a-day world" and went along with the strikers. The U. S. Court of Appeals, however, adopted a loftier view and indicated that the NLRA doesn't protect strikers "in using insulting and profane language calculated to publicly humiliate and degrade employees who are attempting to work." (*Longview Furniture*)

Newly Elected Union Can Get New Contract

When some of your employees (or even all of them) want a different union to represent them, two problems arise:

1. *Will the existence of a contract bar an election of new representatives?* It's pretty clear by now that a contract "of unreasonable duration" will not prevent an election. For example, contracts of more than two years ordinarily will not prevent one.

2. *Suppose a new union is voted in, does the company have to negotiate a new contract or will the old, unexpired one still stick?* The first decision on this point in the 18-year history of the National Labor Relations Board has just been handed down:

The company must negotiate a

How would YOU control costs here?

1. STORING BULKY FILES. Engineers examine one of 90 compact microfilm rolls that reduce 70,000 drawings, each about 6 square feet in area, for simplified, cost-cutting storage. In a process developed by the Diebold Manufacturing Co. for continuous developing of microfilm, rigid temperature control in the fixing tank is essential. An inexpensive Fenwal THERMOSWITCH® unit keeps the "fixing" solution constantly within one degree of the required 100°F.

Photo courtesy of Hotel Statler, Boston

2. KEEPING DISHES SPOTLESS. For this full-time restaurant job, the Statler Hotels and other leading firms serving the public use time-and-labor-saving Colt Autosan Dishwashing Machines. Low-cost Fenwal THERMOSWITCH devices in these machines have two functions. The first is to control temperature of the washing water. Other units act as cut-off switches — stopping the conveyor belt if water becomes too cold.

3. A FENWAL THERMOSWITCH CONTROL may cut your costs, too. Its external, single-metal shell expands or contracts *instantly* with temperature changes, making or breaking enclosed electrical contacts. Compact, highly resistant to shock and vibration, Fenwal THERMOSWITCH units have solved hundreds of otherwise costly problems.

4. SEND FOR THIS CATALOG for complete explanation of the unique THERMOSWITCH unit. Also ask for more detailed, illustrated discussions of the problems above. Fenwal engineers will be glad to help you solve your temperature control problems involving heat, humidity, radiant heat, pressure and other variables. **Write Fenwal Incorporated, 610 Pleasant Street, Ashland, Massachusetts.**

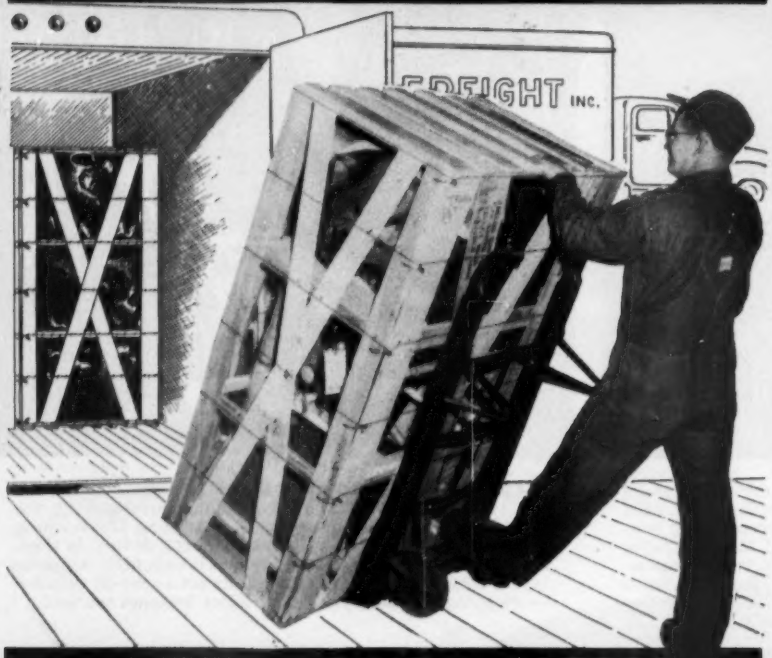
Fenwal

THERMOSWITCH®

Electric Temperature Control and Detection Devices

SENSITIVE...but only to heat

you can BEAT COMPETITION!



if you can SHIP for LESS!

On today's market, where you have to meet stiff price competition and still show a profit, your packing and shipping costs can make a big difference. Think what it would mean, then, if you could turn this kind of saving into a profit margin:

- Cuts cost of packaging materials by 17%
- Cut packing time 60%
- Cut gross shipping weight 9%

That's what *General* Container engineering has accomplished for one company—*on just one item.* On the hard-to-pack cylindrical pressure sterilizer shown above, a General Engineered Container reduced packaging time by 70 minutes, cut the cost of packaging materials by $2.00 per unit, cut gross shipping weight by a full 42 lbs. for Ohio Chemical and Surgical Equipment Company (a division of Air Reduction Company, Inc.). And this is only one of twelve cost-cutting containers we have helped create for this company since 1949.

Every year, hundreds of packaging problems are being solved—at a saving—in General Box Company's two fine industrial packaging laboratories. Let us help you cut packing and shipping costs...increase profit margins... beat competition. Write or phone for full information.

Find out how other manufacturers are cutting packaging costs. Write for your free copy of "The General Box."

General Box COMPANY
1807 Miner St., Des Plaines, Ill.

Factories: Cincinnati; Denville, N. J.; Detroit, East St. Louis, Kansas City, Louisville, Milwaukee; Prescott, Ark.; Sheboygan; Winchendon, Mass.; General Box Company of Mississippi, Meridian, Miss.; Continental Box Company, Inc., Houston.

ENGINEERED SHIPPING CONTAINERS FOR EVERY SHIPPING NEED
• Wirebound Crates and Boxes • Generalift Pallet Boxes • Corrugated Fiber Boxes
• Cleated Corrugated and Watkins-Type Boxes • Stitched Panel Crates • All-Bound Boxes

PRACTICAL LABOR RELATIONS

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new contract. Otherwise, said the Board, the election of new representatives wouldn't have much point.

The ruling involved the American Seating Company of Grand Rapids, Mich., and the Pattern Maker's Association of Grand Rapids which is affiliated with the Pattern Maker's League of North America (AFL).

BRIEF BUT IMPORTANT

► **Pensions aren't peanuts.** Employers kicked in some $3,400,000,000 in 1952 to union pension and welfare funds, according to a Department of Commerce study.

► **Reminder for election day (Nov. 3).** There are new voting-time laws in California, Tennessee, and Missouri. Here's a twist in the California statute: Before employers are required to give workers time off from work to vote, the workers must first show that they can't vote on their own time. If you do business in any of these states, you might check the law before next election day.

► **What makes up the cost of living?** In other words, how important are the various items in the Consumer Price Index? The Bureau of Labor Statistics issues a list of the "relative importance" of each item in the Index as of December 1952. Write to the Bureau at Washington 25, D. C., for your copy.

► **Employment record.** The year 1952 set a new high for civilian

NOW

more sizes of...

Stainless Socket Cap and Set Screws

Available in stock from your Allen ○ Distributor

Demand for rust and corrosion resistant socket screws of high finish 18-8 stainless steel has been increasing steadily for ten years.

Allens have become the leading make because of the inherent advantages of Allen manufacturing methods, and because Allen Distributors carry the widest range of sizes as standard stock items – saving their customers time and money.

Now Allen widens its margin of leadership with still more distributor-stocked standard sizes in stainless:

97 Standard Sizes in Stainless Steel Socket Cap Screws

#4 x ¼" to ⅝" x 3" with NC threads
#10 x ⅜" to ⅜" x 1½" with NF threads

54 Standard Sizes in Stainless Steel Socket Set Screws

#4 x ⅛" to ½" x 1" with NC threads
#10 in lengths from 3/16" to ¾" with NF threads

ALLEN

MANUFACTURING COMPANY
Hartford 2, Connecticut, U.S.A.

Sold only through leading industrial distributors

ROSS MAKES LIGHT WORK OF JOBS LIKE THIS...

Steel plate, I-beams, pipe, lumber, or long pallet loads —this is the fast, simple way to handle it. Ross Carriers go places that other types of equipment can't go. They move your materials indoors or out, over factory floors, unimproved yards or highways. The speed and mobility of these versatile Carriers enables them to handle materials practically anywhere, under all conditions. With them, you move loads between crane-ways, eliminate unnecessary switching between plant trackage, eliminate costly re-handling. They handle the heaviest loads at the least cost.

The picture above shows a Carrier handling heavy timber arches. In steel mills and fabricating plants as well, Ross Carriers cut the cost of inter-building transfer of in-process material, of indoor or outdoor storage of finished material. It will pay you to look into the advantages of Ross Carriers for your own operations. Write us today—discussion of your handling problems entails no obligation on your part.

ROSS CARRIERS
A complete line to meet your particular needs. Capacities: 10,000 to 45,000 pounds.
•
For 40 years, world's first and foremost carriers.

RELY ON ROSS

ROSS CARRIER LINE
Industrial Truck Division
CLARK EQUIPMENT COMPANY
BENTON HARBOR 12, MICHIGAN

PRACTICAL LABOR RELATIONS

Begins on page 252

jobs. 61,300,000 was the average number of jobs that year. Unemployment reached the lowest point since World War II—1,700,000.

► **Have a subversive problem?** The Yale Law Journal, May 1953 issue, has a splendid 30-page article on the right of employers to discharge any suspected subversives.

► **Minimum wage boost proposed again.** Southern competition is hitting New England manufacturers hard enough to induce Massachusetts Senator Kennedy (on his own behalf and that of eight other northern Senators) to introduce in Congress a bill which increases the minimum under the Wage-Hour law from 75¢ to $1 an hour.

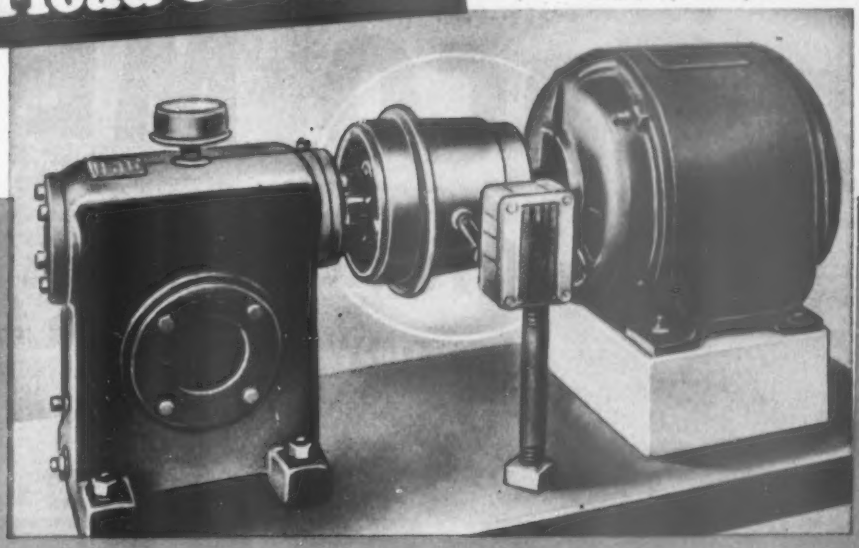
► **"Unfairness" on the increase.** General Counsel George J. Bott of the National Labor Relations Board reports the issuance of a record number of unfair labor practice complaints during the second quarter of 1953 — more than in any 3-month period since the Taft-Hartley Act was passed.

►**Tool planners and designers not always "professionals."** NLRB doesn't consider the tool planners and designers of the Brady Aviation Corp. as professional employees. They lack formal education and many are promoted from production jobs.

►**New fringe benefit.** Here's a new fringe benefit for you to fret over: condolence pay. Gives a worker average pay up to three days if he is absent because of death in his immediate family. Appears in a contract between Horrocks-Ibbotson Co. and Textile Workers Union (CIO), Utica Local 41.

Save Cost of Down-Time

Anchor-Waldron Automatic Overload Cut-Out



Flexible Coupling Type For Direct Connected Drives

●

Pulley Type For Belt and Chain Drives

automatically shuts off motive power...
resumes operation with push of a button

These automatic mechanical units make use of increasing torque to control the operation of machinery. They protect horsepower and save the time losses caused by sheared drive pins. Siren or light signals can be installed to give ample warning of a build-up in load. Wherever continuous operation of conveyors is essential, the positive overload protection afforded by the Anchor-Waldron automatic cut-out can prove a paying investment.

Our new Catalog No. 51 gives full information, sizes, ratings and other engineering data on both coupling and pulley types. Write for your copy.

JOHN WALDRON CORPORATION

Waldron Series "A" and Junior Gear Couplings | Francke Pin Type Coupling | Anchor-Waldron Overload Cut-Outs

NEW BRUNSWICK • NEW JERSEY

Sales Representatives In Principal Cities • In Canada—Peacock Brothers, Ltd.

Announcing...

a new service from Ampco

AMPCO* METAL

Grade 24 Die Blanks

now available from stock

LET AMPCO PROVE ITS METAL

Stainless steel kitchen utensils and wash machine tub produced on Grade 24 dies.

Ampco Grade 24 die used in forming 120,000 stainless steel pieces.

...the dies for forming and drawing stainless steels that give longer runs, reduce scrap, cut your costs

This is good news for everyone who makes drawn or formed stainless parts. Now you can get immediate delivery on 70 sizes of solid rounds, rectangles, and centrifugally-cast rings *at new low prices* for your stainless drawing, forming, or bending operations.

Die blanks of Grade 24 Ampco Metal have become so popular that commonly used sizes are now available from Milwaukee stock. Types and sizes include:

34 sizes of solid rectangular pieces from ½" x 1" x 12½" to a maximum of 4" x 4" x 12½".

27 sizes of centrifugally cast blanks from 4" OD x 1" ID x 1½" thick up to 20" OD x 12½" ID x 2" thick.

11 sizes of solid rounds up to 5" OD x 12½" long.

The popularity and wide acceptance of this special alloy for forming or drawing stainless or other "hard-to-work" materials is due to these advantages — advantages you get only with Ampco Grade 24:

1. **Your usual scrap losses are minimized** because Ampco grade 24 dies are non-galling, non-loading.

2. **Less time is required for finishing operations** . . . your costs are cut. Grade 24's unique bearing qualities and low co-efficient of friction eliminate scratches and die marks on surface of pieces drawn.

3. **You get longer runs** without redressing caused by pickup, *longer die life, reduced downtime.* This remarkable alloy gives a die life 3 to 5 times greater than other bronzes and many times that of conventional steel dies.

Don't wait any longer to enjoy low-cost, trouble-free production of drawn metal parts. If you draw, form, perform roll forming, or reduce tubes or similar sections — if you use stainless, pickled carbon steel, silver, zinc, lead, or Inconel or Monel metals — Ampco Grade 24 is just right for you. Send the coupon today for complete information and prices.

Pressure pad used with die above.

A group of Ampco dies.

Stainless steel auto trim formed over Ampco Metal Grade 24.

*Reg. U. S. Pat. Off.

Mail this coupon today!

Ampco Metal, Inc.

MILWAUKEE 46, WISCONSIN

WEST COAST PLANT, BURBANK, CALIFORNIA

Ampco Metal, Inc.

Dept. FM-10, Milwaukee 46, Wis.

Please send me a copy of Ampco Grade 24 stock die folder at no obligation.

Name.....

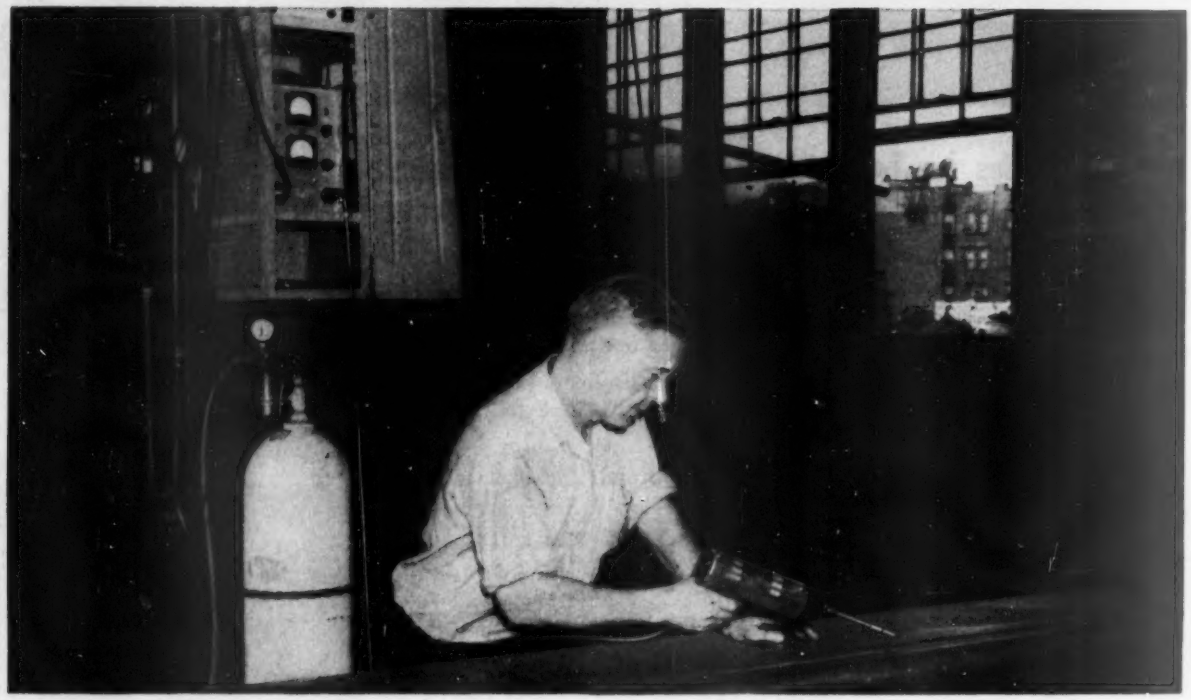
Title.....

Company.....

Company Address.....

City.....(.....) State.....

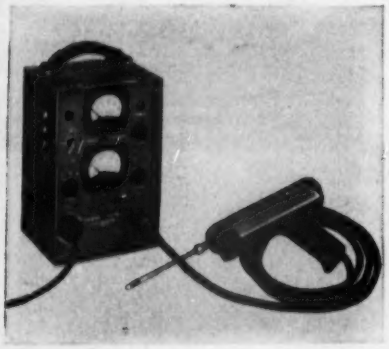
LABORATORY INSTRUMENTS



G-E LEAK DETECTOR HAS REPLACED ANTIQUATED "SOAP SUDS" METHOD OF FINDING LEAKS AT ANGLE PRODUCTS COMPANY.

Steel Fabricator Uses G-E Leak Detector To...
Reduce Rejects, Cut Inspection Time 35%

"We have cut rejects, and the leak detector is approximately 35% faster than our former method," reports H. I. Savage, Chief Engineer at Angle Products Company, Cleveland, Ohio.



G-E Type H-1 leak detector is portable, easy-to-use; composed of two units: control unit and pistol-grip detector.

The company, steel fabricators of such things as truck cabs and steel tanks, had used a soap-suds solution in testing for leaks prior to their recent purchase of a General Electric Type H-1 leak detector.

EXTREME ACCURACY

"The thing we especially like about the G-E leak detector is its extreme accuracy as compared with the 'soap-suds method' we formerly used," continues Mr. Savage. Rejects based on leaks that had not been uncovered by the "soap-suds" method prompted the Angle Products Company to try the G-E device. The G-E leak detector has resulted in manpower savings, the virtual elimination of rejects, and increased profit.

NEW FEATURES

Ideal for locating leaks in all industrial applications where a halogen-compound gas, such as Freon 12**, may be introduced as a tracer, the new General Electric Type H-1 leak detector has added features for improved and simplified operation. In addition to indicating a leak on the control panel, the new detector now provides an audible signal. A new rebalancing circuit now automatically compensates for backgrounds concentrations of halogen gas. To compensate for any fluctuations in the voltage supply, the detector now includes a built-in stabilizing transformer.

AVAILABLE FROM STOCK

A complete unit costs only $604.50* and can be shipped from stock immediately. For further information, contact your nearest G-E Apparatus Sales Office, or check coupon for Bulletin GEC-233.

*Manufacturer's suggested retail price.

**Registered trade-mark, Kinetic Chemical Div. of E. I. du Pont de Nemours & Co.

FOR PRECISION MEASUREMENT

Standardize Surfaces with G-E Roughness Scales and Specimens

Filter Manufacturer Cuts Spoilage Costs Up To 90% With G-E Roughness Scales

Air Maze Company, Cleveland, Ohio, manufacturers of filters for all purposes say that their G-E surface roughness scales and specimens have reduced manufacturing expenses by cutting spoilage costs 90%. "They have provided us with real savings in both time and money," stated H. W. Matlock, chief draftsman for Air Maze.

HANDY, LIGHT WEIGHT

Daily use is made of the roughness specimens in preparing the specifications and blueprints for component filter parts. Then, with the handy lightweight scales,

At Air Maze Company, component parts are checked for proper roughness with General Electric surface roughness scales.

Air Maze makes certain that the finishes on parts received from their vendors are correct. When there is a question as to the suitability of a standard part, the roughness scales end the argument, this company reports.

ASSURE UNIFORM SURFACES

G-E surface roughness scales and specimens are particularly valuable when parts, manufactured by several subcontractors or by different departments in one manufacturing plant, must have uniform surfaces roughness. The scales and specimens provide a common basis for the engineer, draftsman, machinist, and inspector in determining, supplying, and approving the correct surface finish.

FLEXONICS CORP. INSPECTOR USES SPECIMENS TO ASSURE STANDARDIZED SURFACES

Roughness Specimens Aid in Manufacture of Aircraft Parts

Referring to their General Electric surface roughness specimens, Fred O. Allen, Chief Inspector of the Elgin Division of the Flexonics Corporation said, "We just couldn't do without them. They provide us with a standard to go by, prevent a lot of controversy or differences of opinion, and as a result, save us considerable time."

The Elgin Division of the Flexonics Corporation, Elgin, Illinois, manufactures component parts for jet engines and other aircraft assemblies. These parts, which require precise surface roughnesses, are given production as well as final inspection with General Electric surface roughness specimens to assure uniformity and adherence to the specifications set up by the jet engine or aircraft manufacturer.

FURTHER INFORMATION

A complete set of G-E standard roughness specimens consists of ten metal blocks. The complete set is priced at only $85.02*. General Electric's surface roughness scales are composed of two small metal rules. The price of both scales is but $20.12*. Further information about the many uses for these highly versatile tools may be obtained from your nearest G-E Apparatus Sales Office, or simply check the coupon below for Bulletin GEC-774.

SECTION A603-54, GENERAL ELECTRIC COMPANY, SCHENECTADY 5, N. Y.

Please send me the following bulletins:

☐ Roughness Scales and Specimens (GEC-774)

☐ Leak Detector (GEC-233)

NAME .....

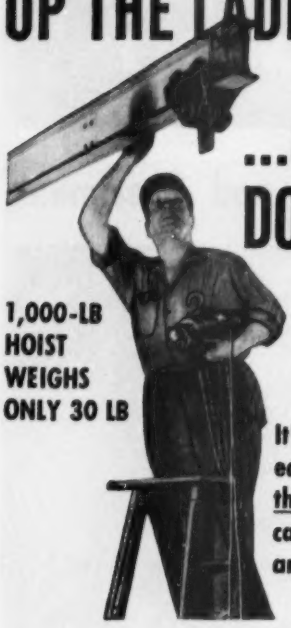
COMPANY .....

STREET .....

CITY ..... ZONE ..... STATE .....

GENERAL ELECTRIC

UP THE LADDER



...and DOWN

1,000-LB HOIST WEIGHS ONLY 30 LB

It's as easy as that to carry and hang

KELLER
Air Hoist

One man handles it easily . . . makes replacements in minutes . . . avoids "down time" that might keep a whole department idle.

VARIABLE SPEED with fingertip control—spots loads accurately.

CAN'T BURN OUT from stalling. Not affected by dust and fumes. Maintenance costs are negligible!

Spotting heavy parts on a planer table

SEND FOR DETAILED INFORMATION

KELLER
Pneumatic Tools

KELLER TOOL CO., GRAND HAVEN, MICH.

It Pays to Look at Your Scrap Pile

This company did.
And found $300,000 annual savings.

ONCE YOU'VE SET the raw material size, it's difficult to reduce scrap. If you start with material planning, you can . . .

. . . cut fabricating scrap on a product to the minimum.

. . . get material in sizes you thought you couldn't buy, at little or no extra cost.

. . . combine material orders for individual products to reduce left-overs.

CASE IN POINT · A five-month study, started in the salvage yard of Consolidated Vultee Aircraft Corporation's San Diego Division, has brought about an annual savings to date of $150,000 in the cost of extrusions. And further studies along this line indicate possible annual savings of $300,000 on this one type of item.

Similar studies on tubing, bar stock, hinges, and gang channels may eventually bring about cost reductions amounting to $500,000 annually—according to E. E. Hartzler, supervisor of cost reduction, and C. A. Lorenz, who conducted the surveys.

The initial survey was begun after an alarming amount of surplus extrusion stock was noted moving into the salvage yard for scrap—flat trailer loads daily.

A check over a 30-day period disclosed a total of 13,075 feet of scrap. 51% of these items were over 4 feet in length. Many were found to have more than 100 pieces of cut-offs.

There are 750 types of extrusions utilized in the two plants (with a total of about 23,000 workers) that make up the San Diego Division. The study was limited to a few typical examples and to items having more than 100 pieces of cut-offs. It included an analysis of procedures for ordering extrusions, from the engineering department level to fabrication in the shop.

The first step was to determine the proper lengths of extrusions, as related to actual requirements, that should be ordered from the mill. At this point it was found that the difference between the amount required and the amount used cost $30,185 on the items under analysis. Allowing a liberal discount of 50% on this amount for legitimate scrappage left a possible saving of $150,000.

Something Convair didn't know, and brought to light by the survey, was that its mill suppliers make no premium charge for cutting to length any extrusions from 3 to 30 feet, providing the total order for that type of extrusion is 100 pounds. With this point in mind, the study then began to look for a way to improve current ordering methods.

The normal procedure was for tooling and material departments to get engineering determinations on a new project, and then for tooling to set up a material number.

Here was the base of the difficulty. The material department, in setting up quantities of extrusions for ordering, arrived at the most common length

NOW! Tuffy Twins Team Up

TO CUT CRANE HOISTING COSTS!

A NEW

Tuffy HOIST LINE

As Tough as Tuffy Slings

Throughout industry where slings are used, Tuffy Slings have set high performance records. Their extra flexible, non-kinking, non-knotting, patented 9-part braided construction has in a few years made Tuffy the sling preferred by the men who work with them and the men who watch sling costs.

Many times our engineers have been propositioned to develop a hoist line which would measure up to Tuffy Slings in flexibility, wearability and extra toughness to absorb load shocks and stay on the job longer, and cut downtime and hoist line costs.

Now, you can forget about all the complicated specifications you've wrestled with in buying hoist lines. Just give the diameter and length wanted and specify Tuffy Hoist line.

After many months of laboratory research and many more months of testing in field, Union engineers are ready to put the *New Tuffy Hoist Line* up against any rope ever used on overhead, stiff leg and mobile cranes. Reports from the field tell of Tuffy Hoist Lines running two and three times as long as the ropes previously used. Next time reeve your crane with Tuffy.

Write for 48 page Sling Hand Book and Rigger's Manual and information on Tuffy Hoist Line.

Forget Specifications...

Say Tuffy To Your Distributor...

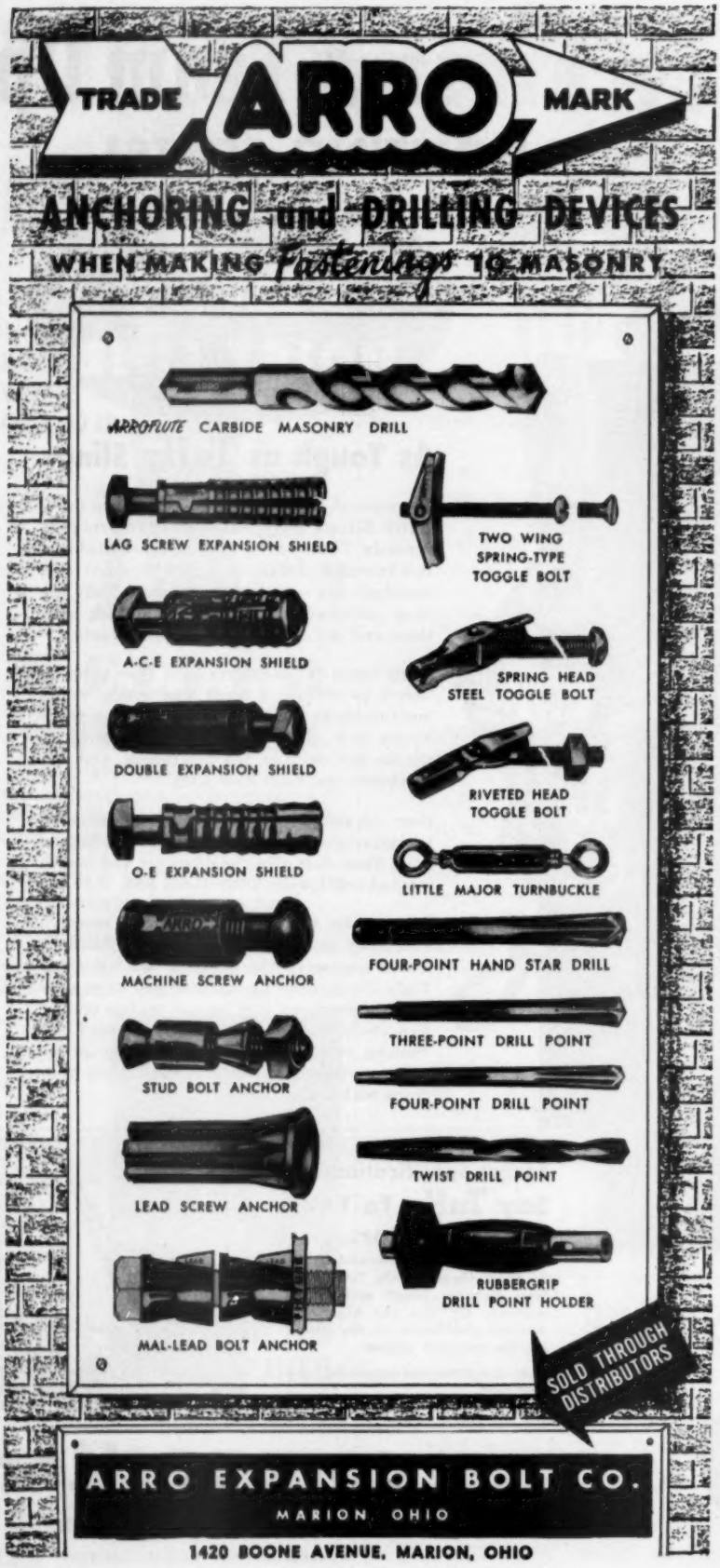
and tell him the diameter and length. To order slings, specify Tuffy, sling type, diameter, length and fittings wanted. Or you can buy Tuffy braided wire fabric on the reel if you do your own rigging.

Your distributor can supply the Tuffy you need.

union Wire Rope **corporation**

2234 Manchester Avenue • Kansas City 26, Mo.

Specialists in High Carbon Wire, Wire Rope, and Braided Wire Fabrics



of material in relation to engineering designations. This invariably became the basic length for ordering, regardless of usability in other dimensions or projects.

It was found that determination of lengths had to start with more emphasis on the planning level than on engineering. A sort of "pre-planning" developed by which Convair was able to call out in advance the desired lengths within an inch or two.

The advance angle was considered essential because of the long lead time—as much as five months—after engineering had completed its work.

In one typical case under analysis, it was found that the processing involved stretch-forming of an extrusion into a large circle, which was then cut into arcs for use. Under the old system of ordering, an allowance was made for stretch-forming of each individual arc, despite the fact that it was done in one operation. An extra length was needed only at either end of the entire piece instead of for each individual arc.

Here are the new ground rules:

Manufacturing Control

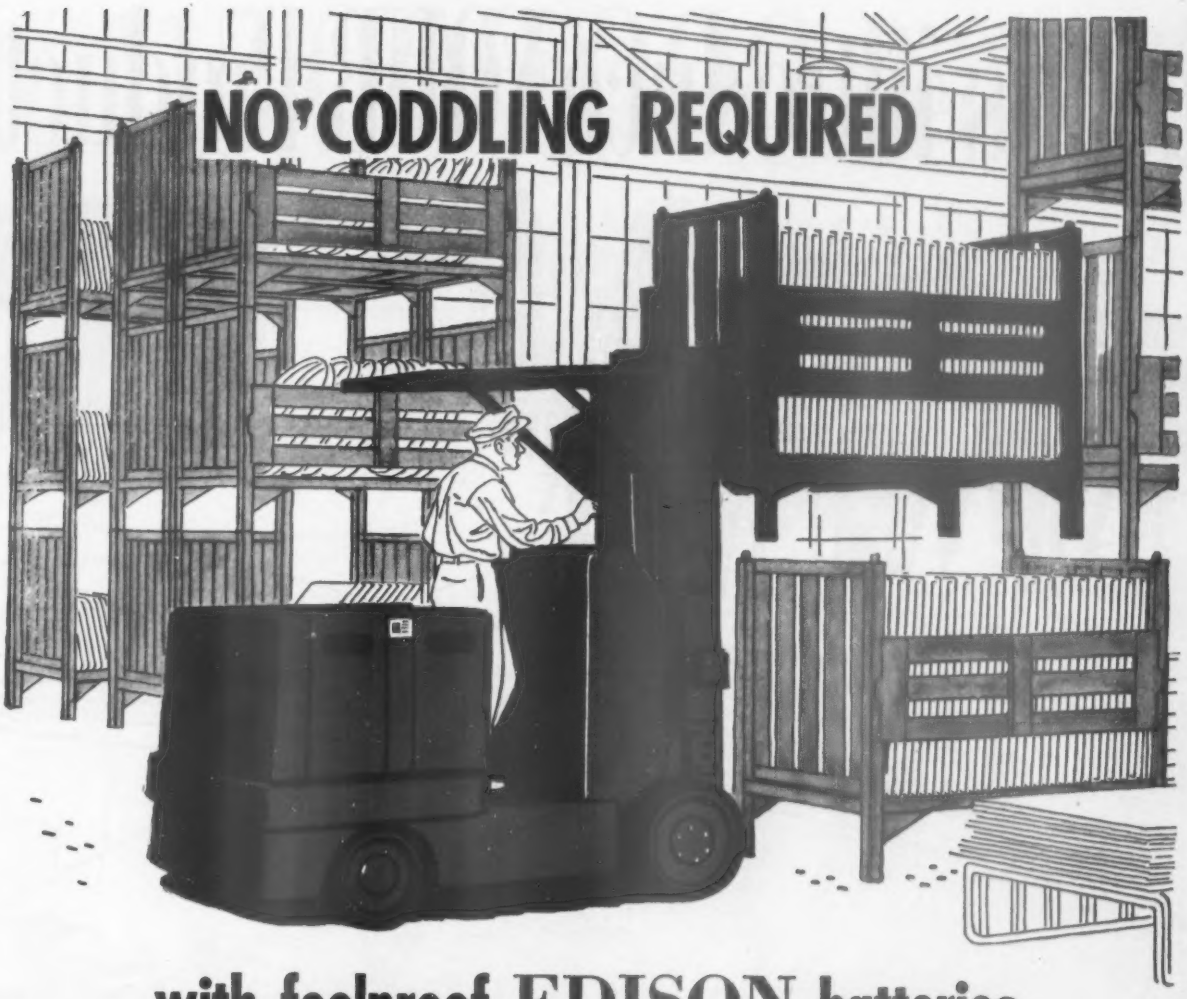
1. Parts release personnel to compile detailed list of extrusions required by type, condition, and length—and allowing for stretch-forming, rolling, etc.
2. These figures to be expressed in feet and/or decimal part of a foot only.

Material Control

Material control ordering group to make the analytical study and determination of extrusion length to be bought and assign material numbers accordingly.

Advantages

1. A standard unit of measure.
2. More suitable lengths and less waste.
3. Manufacturing control to be responsible for requirements.
4. Material control to be responsible for procurement.



with foolproof EDISON batteries

Long, trouble-free battery life, *without babying*, is a matter of record at the eastern plant of a large stove manufacturer. Truck-operation reports show no failure attributable to the EDISON batteries that power them.

A 24-hour accidental overcharge—obviously contrary to recommended practice—did not harm one of the batteries. After being watered to the proper level, it was in perfect condition, ready to go to work. Regular maintenance in this plant is simple—consists merely of proper watering, charging, occasional cleaning.

Fast boost-charges provide additional power. When temporary increase in plant production required maximum truck operations during two shifts, boost-charges during lunch hour provided the extra power needed until more batteries could be put in service.

For all 'round service—foolproof operation, dependable power, longer life, lower maintenance cost, less downtime—you can't beat an EDISON. Made of steel, it out-works, out-lasts other types of batteries. You can get the same kind of service on *your* job, by calling your Edison field engineer. He'll gladly give you complete information. Or send for Bulletins S.B. 2039 and S.B. 3808. Edison Storage Battery Division of Thomas A. Edison Incorporated, West Orange, N.J.

Most Dependable Power—

Lowest Over-All Cost

. . . you get both with an EDISON

EDISON

Nickel · Iron · Alkaline

STORAGE BATTERIES

Let us introduce YOUR Product

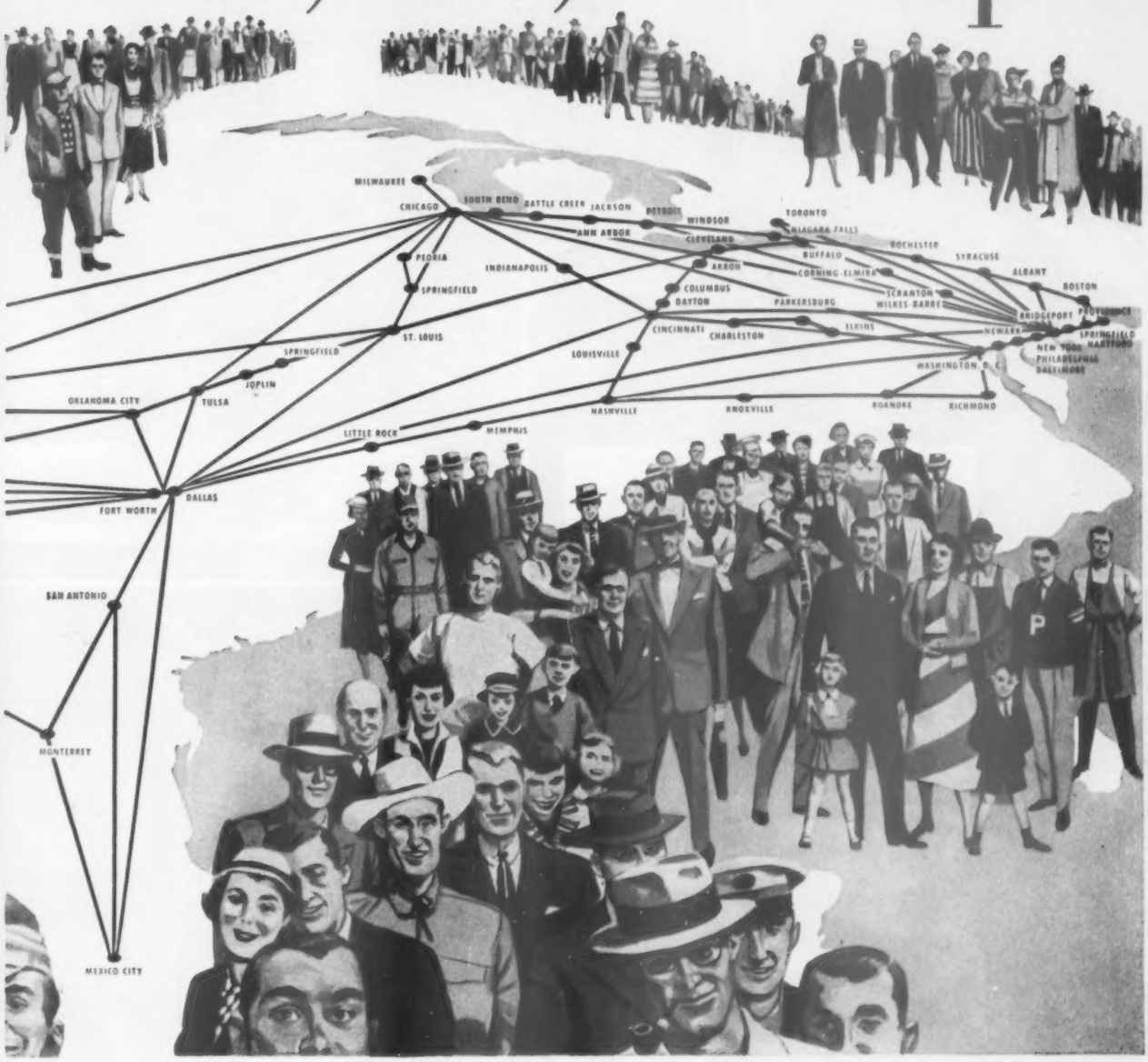
Everyone a prospect...everyone living in States served by AMERICAN AIRLINES AIRFREIGHT

THINK OF IT! One hundred and fifteen million people*... about two-thirds of the entire population of the United States... live in areas served by American. Translated in terms of retail markets, this figure becomes even more impressive.

It means seventy-seven key cities—or 2 out of every 3 of the top thirty retail markets—can be reached in hours when you ship your wares American Airfreight.

That's why American can match your sales territories better than any other air carrier. And serve

to 115,000,000 People!



them better, too! For, in addition to more experience and superior facilities, American offers next day deliveries on coast-to-coast shipments, thanks to DC-6A Airfreighters—newest, largest, fastest cargo carriers in commercial aviation today!

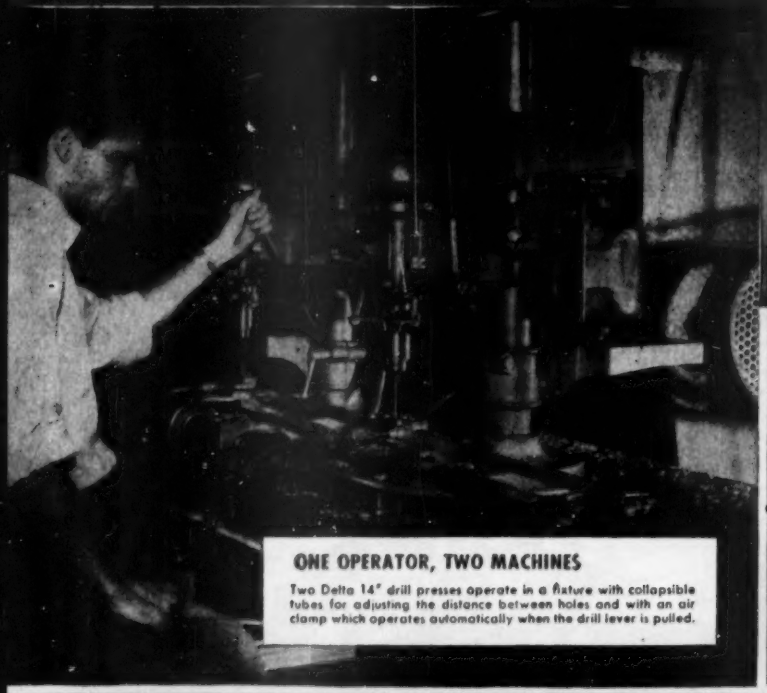
For the complete story, wire collect to American Airlines, Cargo Sales Division, 100 Park Avenue, New York 17, New York.

*Sales Management Survey of Buying Power—May '53

AMERICAN AIRLINES INC.

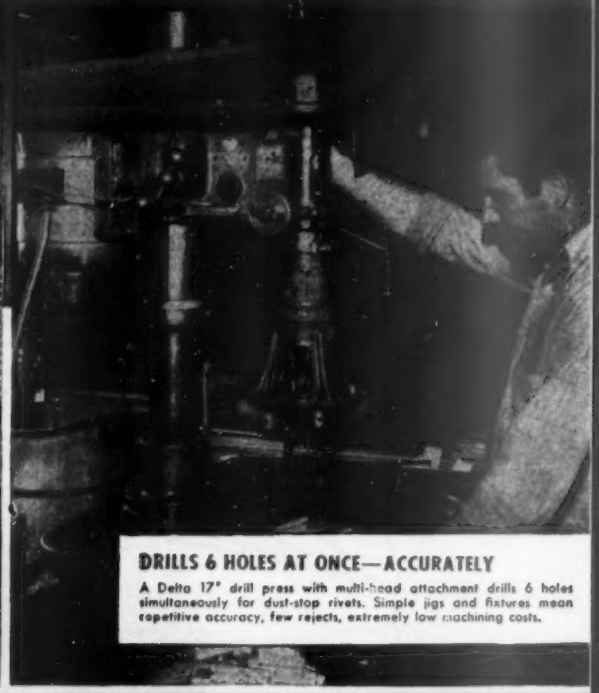
America's Leading Airline

USING 21 DELTA DRILL



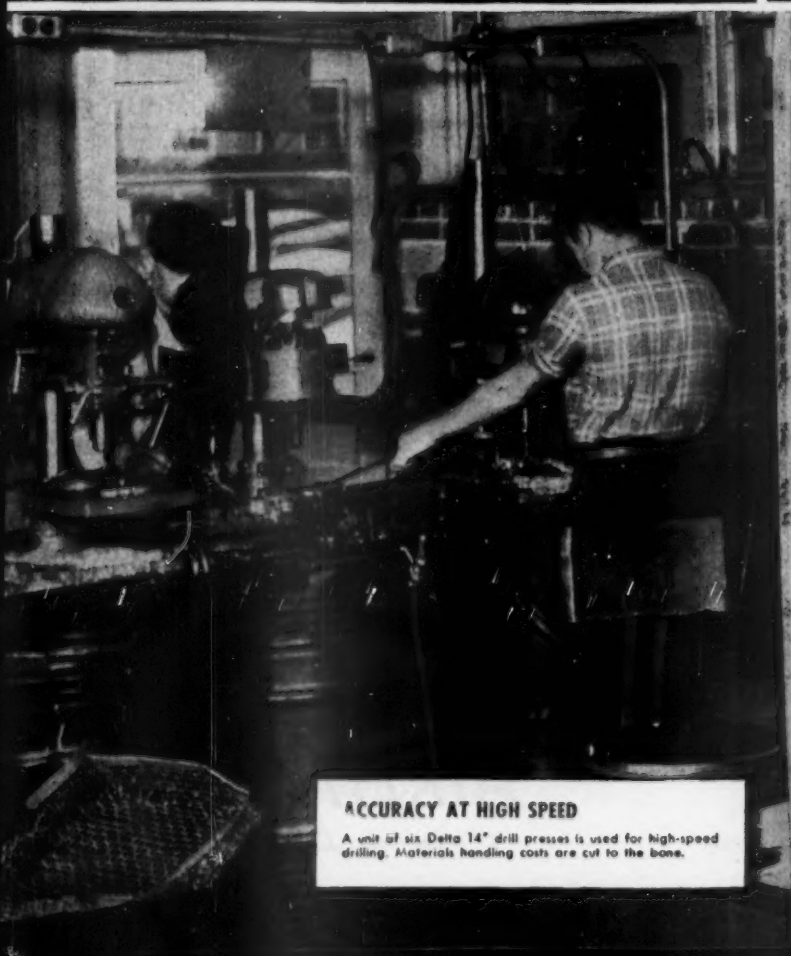
ONE OPERATOR, TWO MACHINES

Two Delta 14" drill presses operate in a fixture with collapsible tubes for adjusting the distance between holes and with an air clamp which operates automatically when the drill lever is pulled.



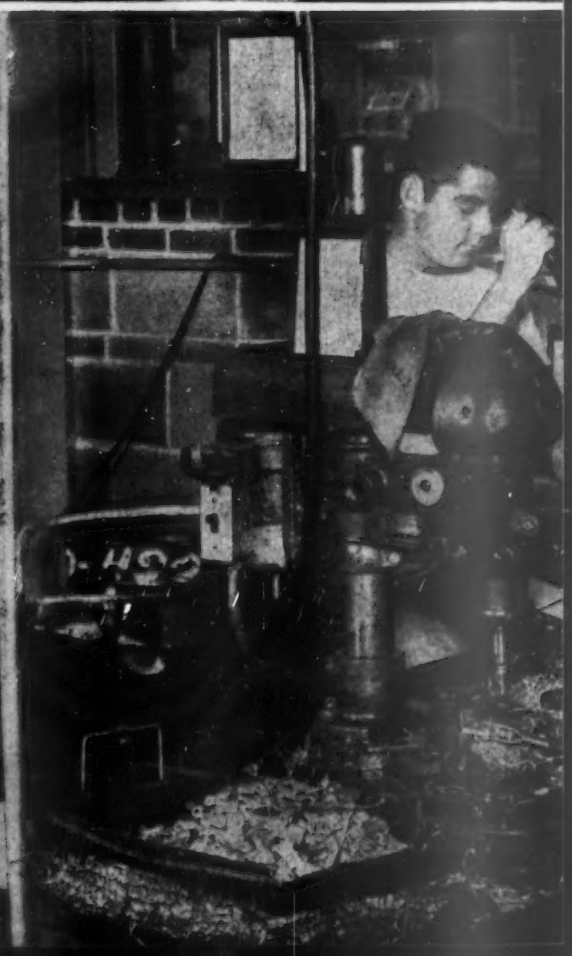
DRILLS 6 HOLES AT ONCE—ACCURATELY

A Delta 17" drill press with multi-head attachment drills 6 holes simultaneously for dust-stop rivets. Simple jigs and fixtures mean repetitive accuracy, few rejects, extremely low machining costs.



ACCURACY AT HIGH SPEED

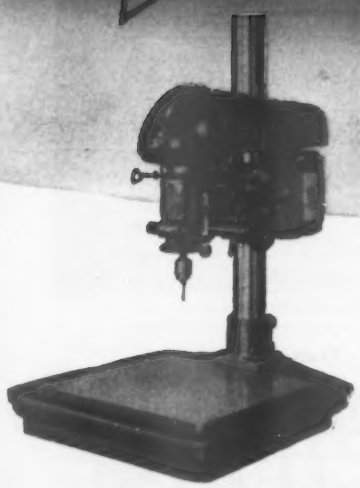
A unit of six Delta 14" drill presses is used for high-speed drilling. Materials handling costs are cut to the bone.



PRESSES,

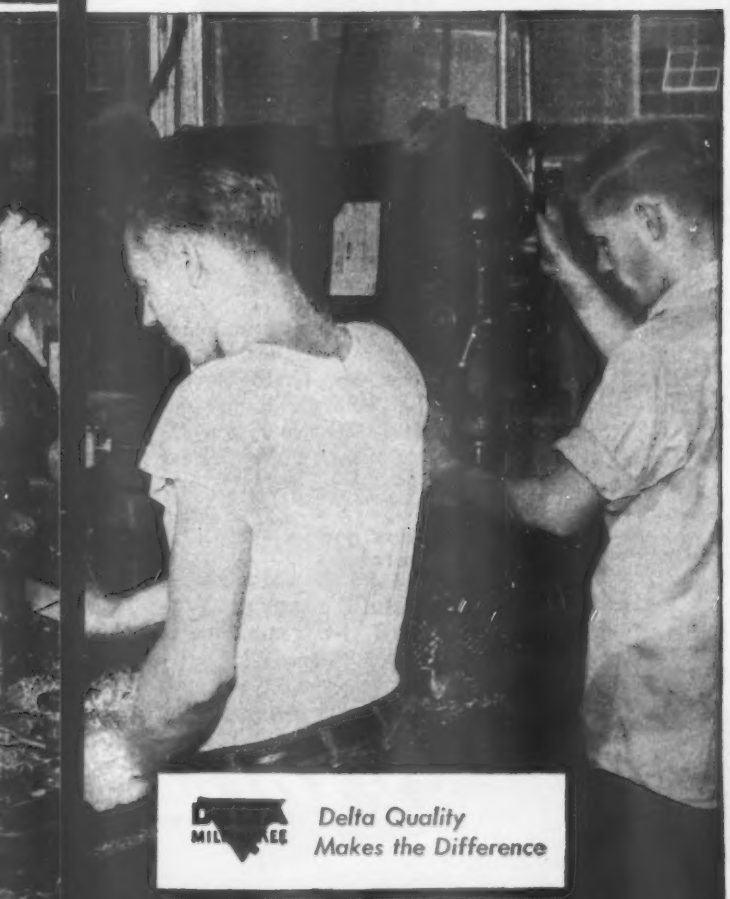
MAINTAINS INCENTIVE

SPEEDS PRODUCTION!



Plus gaining these added benefits that increase work flow:

- Less Materials Handling
- Greater Flexibility—
  Move the Tools to the Job,
  or the Jobs to the Tools
- Easier Operating Training
- Direct Savings in Labor Costs
- Negligible Maintenance



Delta Quality Makes the Difference

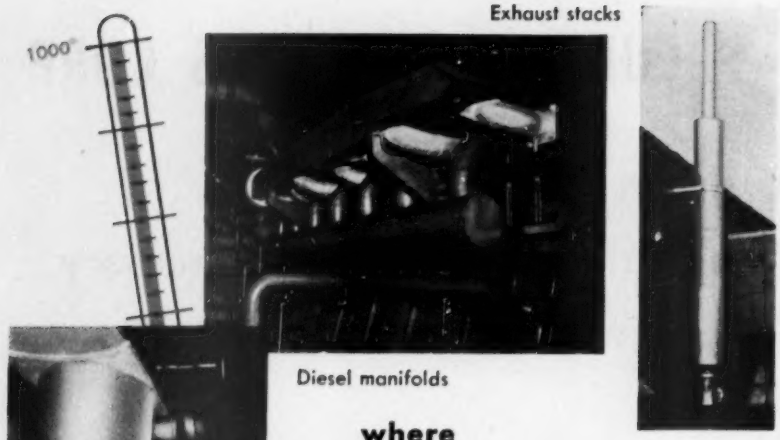
For less than the cost of one major machine tool, Cupples Products Corp. bought 21 Delta drill presses, spotted them at key points in their production line and got the results listed above.

Isn't it "good business" to examine your own shop procedure and see if the Cupples plan won't work for you? It has in hundreds of plants. Ask your dealer about Delta tools—sturdy, light, accurate, versatile, mobile and best of all, very inexpensive.

Your Delta dealer is listed in the yellow pages of your phone book under "Tools" or "Machinery." If you'd like catalog AB52, which describes the complete Delta line, ask him for a copy—or write to: Delta Power Tool Division, Rockwell Manufacturing Co.,628K North Lexington Ave. Pittsburgh 8, Pa.

DELTA QUALITY POWER TOOLS

Another Product by **Rockwell**



where
HEAT eats metal
paint with
THERMALITE
and protect up to
1000°

Kiln heat ducts

Locomotive engines

Boiler fronts

NEW SILICONE HIGH-HEAT ALUMINUM PAINT FUSES TO METAL . . . PROTECTS AGAINST RUST AND CORROSION

A revolutionary paint development, Thermalite fuses to metal, will not discolor, blister, burn or flake off—even at 1000° heat! Protects against rust, corrosion, chemical fumes. Formulated to stand severe weather exposure as well as high heat.

Ordinary aluminum paints flake off under high heat because the resins burn out. Thermalite's film-forming solids consist of "silicones"—the wonder resin that defies heat, fuses to metal, producing a tough, silver-bright, tightly-adhering coating.

In hundreds of applications industrial users have proved that Thermalite solves their problem of obtaining a paint coating that withstands 400° to 1000° heat. Two types available, one for interior, the other for exterior metal surfaces.

FREE! . . . to industrial paint users. Your letterhead request brings complete information on Thermalite for interior or exterior use. Write today!

THE TROPICAL PAINT AND OIL COMPANY
1122-1296 W. 70th, Cleveland 2, Ohio
Heavy-Duty Maintenance Paints Since 1883

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Subsidiary of
Parker Rust Proof Company

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Free NEW CATALOGS

Begins on page 158

ELECTRICAL EQUIPMENT

8 Electrical Fittings
Here are maker's lines of solderless wire connectors and specialized electrical fittings. Terminal blocks, bushings, and plugs are included in the many illustrations. Application instructions, dimensions, and specs. Catalog 53. 16 pages. Buchanan Electrical Products Corp.

9 Transformers
An indoor current transformer—600 volts, 200-800 range—for operating watthour meters or instruments is featured in Bulletin GEC-956. Construction highlights and engineering data. 4 pages. General Electric Co.

10 Arc Welding Machines
This 44-page catalog describes more than 20 different types of arc welding machines, including a-c, d-c, inert-gas models. Illustrations, operating data, and specs. Catalog No. 1340. Air Reduction Sales Co.

11 Power Tools
Drills, grinders, hammers, saws, sanders, and polishers are among the many portable electric power tools illustrated and described in Catalog 39-A. Specifications and prices. 40 pages. Thor Power Tool Co.

12 Motors and Generators
Bulletin 1450 gives you the story on a line of d-c motors of ½- to 300-hp; and d-c generators of ¾- to 250-kw. Suggests a variety of applications. Cut-away photographs show mechanical construction. Features, rating tables, and specifications. 16 pages. The Louis Allis Co.

Turn the page

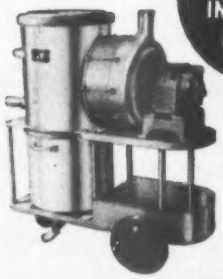
This unretouched photograph graphically shows Invincible's remarkable cleaning power.

This ½" H. P. Invincible All Service Cleaner is equally efficient on wet or dry pick-up.

INVINCIBLE... in name and service

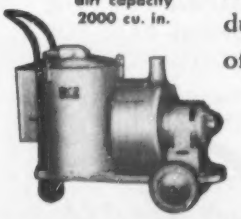
Model 809-B
5 H.P.,
dirt capacity
3 cu. ft.

SOME OTHER INVINCIBLE MODELS



Model 460
1½ H.P.,
dirt capacity
3020 cu. in.

Model 415-A
1½ H.P.,
dirt capacity
2000 cu. in.



Harmful dust and dirt in your plant can be removed faster, with less manpower and at lower cost by Invincible Vacuum Cleaners. The result: better working conditions and less damage to equipment and product.

Invincibles also efficiently remove or recover scores of other industrial materials.

Reliable, heavy duty Invincibles have served industry more than 40 years. Let us make a survey of your cleaning or reclaiming requirements.

FREE BOOKLET
tells how Invincibles save money in every type of industry. Write for it NOW!

INVINCIBLE VACUUM CLEANER MFG. CO.
DOVER, OHIO
FOR 40 YEARS, LEADERS IN INDUSTRIAL VACUUM EQUIPMENT

McCaskey Tool Crib Control installation in the Elyria, Ohio plant of The Pfaudler Co., prominent manufacturer of glass lined, glassed steel and stainless steel tanks, pressure vessels and other process equipment.

THE PFAUDLER CO. another plant to report QUICK RETURN on their investment in McCASKEY TOOL CONTROL

Mr. C. S. Rieley, Chief Industrial Engineer of The Pfaudler Co., Elyria, Ohio, states:

"McCaskey Tool Crib Control was installed here in 1950. Tool purchases were reduced $1800 during the first year.

"At the start of operations 3,757 expendable tools such as drills, taps and reamers having a value of $5375 were turned in to the crib. In addition, more permanent types of tools such as chucks, boring bars, sleeves, etc. valued at over $3000 were recovered.

"Another significant saving resulted from elimination of idle machine time while operators searched for tools.

"The McCaskey Tool Crib system provides us with fast, reliable service, allows the attendant ample time to regrind and maintain the tools in properly sharpened condition, keeps tool stocks at a workable minimum and helps reduce breakage through simple control records.

"SAVINGS IN REDUCED TOOL PURCHASES ALONE IN THE FIRST FEW MONTHS PAID FOR THE ENTIRE INSTALLATION."

Mail coupon for further evidence that McCaskey Tool Crib Control quickly returns its first cost in continuing savings in plants both large and small.

McCASKEY REGISTER CO.
ALLIANCE, OHIO
Send me complete facts on McCaskey Tool Crib Control.

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Position .....
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McCaskey Systems, Ltd., Galt, Canada
The McCaskey Register Co., Watford, England

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Free NEW CATALOGS

Begins on page 158

13 Motor Starters
Maker's combination motor starters, NEMA sizes 0-6, are described in this 8-page bulletin. Illustrations of models available. Catalog Nos. 514 and 515. Federal Electric Products Co.

MATERIALS HANDLING

14 Feeders
Feeders that regulate the flow of materials from bins and hoppers to conveyors or other processing equipment are described in Bulletin No. 33-E. Illustrations and diagrams show types available. 12 pages. Hardinge Co. Inc.

15 Handling Equipment
"The How Book of Cost-Cutting Materials Handling" is the title of a 26-page booklet giving you a practical method of checking your handling costs. Illustrations and diagrams show how manufacturers employ modern materials handling machinery to cut costs. Catalog No. P902. Yale & Towne Mfg. Co.

16 Conveyors
Packaged handling systems are featured in this 16-page booklet. Illustrations include boom, belt, and roller type conveyors in a variety of applications. Specs and capacity data. Form 2591. Alvey Conveyor Mfg. Co.

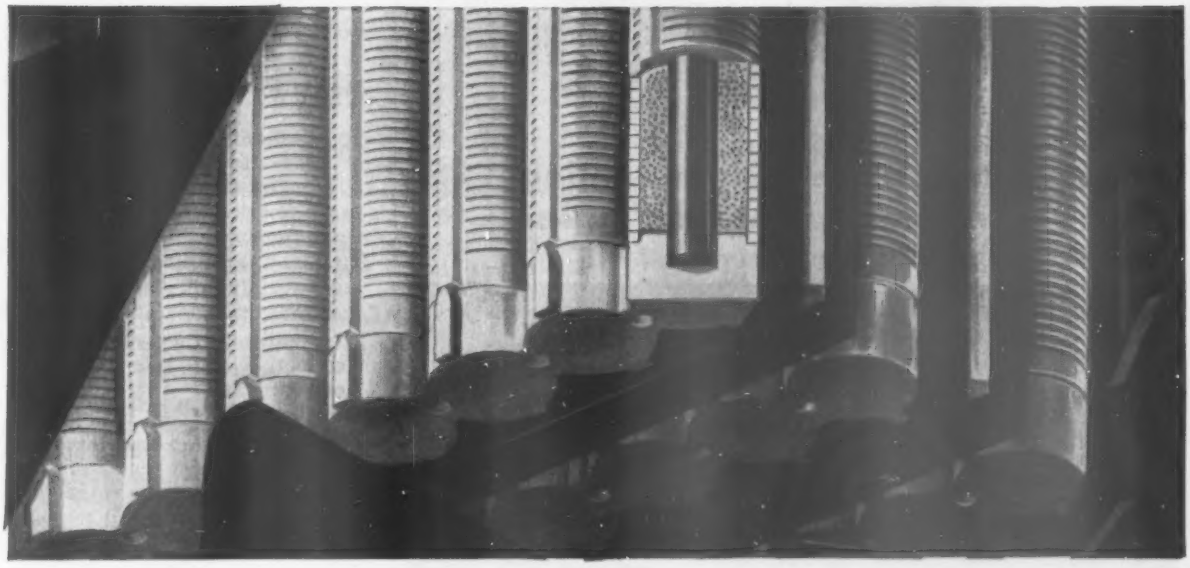
17 Tongs and Hooks
There are tongs and "C" hooks for handling materials in a great variety of shapes, sizes, and weights in this 24-page catalog. Illustrations suggest applications. Schematic diagrams show typical operations. Catalog No. 753-5M. Heppenstall Co.

Turn the page

For industrial trucks...Exide-Ironclad now offers

★ 20% more capacity in the same space

★ Lowest cost per A.H. to own and operate



This cutaway picture shows the inside of the new T H EXIDE-IRONCLAD Battery.

Its larger positive plates, containing corrosion-resistant Silvium, are different . . . unique . . . exclusive! No other type of positive plate construction offers you the advantages of the T H Exide-Ironclad, with its slotted plastic tubes, permanently sealed on the bottom with polyethylene tube sealer. More active material is exposed to the electrolyte, resulting in greater power. More active material is retained, providing higher battery capacity for a longer working life. Other features include improved negative plates . . . practically indestructible Pormax separators . . . new sealing compound . . . shockproof molded jar . . . unbreakable quarter-turn vent plugs of plastic . . . corrosion-resistant tray coating.

All of the features of the new T H Exide-Ironclad Battery construction provide direct operating-hour savings for you.

Now-more than ever before... YOUR BEST POWER BUY AT ANY PRICE!

1888... DEPENDABLE BATTERIES FOR 65 YEARS... 1953

The new T H Exide-Ironclad BATTERY

Thrifty Hauler

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 2 • *Exide Batteries of Canada, Limited, Toronto*

"EXIDE", "EXIDE-IRONCLAD", "SILVIUM", "PORMAX", *Reg. T.M. U.S. Pat. Off.*

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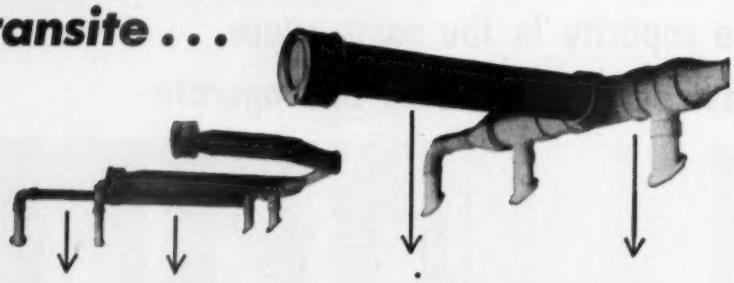
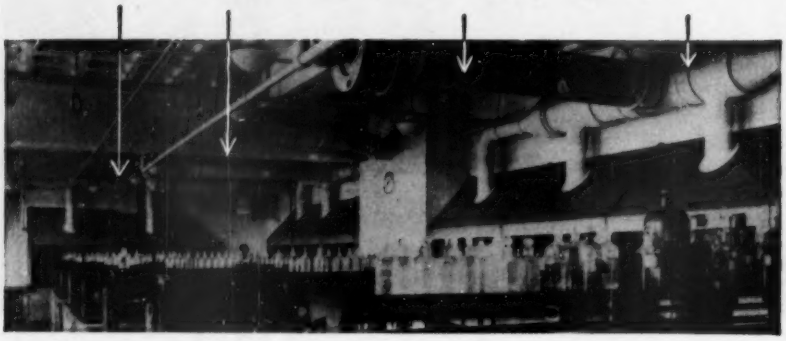


. . . a tough problem of venting corrosive fumes and gases



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is corrosion-resistant, long-lasting

HERE ARE 3 GOOD REASONS why the Transite* Industrial Vent Pipe shown here can be expected to keep down the costs of venting aggressive gases in the laboratory, and to do it for a long time to come:

1. **It's made of asbestos and cement—cannot rust or rot.**
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3. **It is resistant to practically all corrosive fumes, mists and gases.**

Transite Industrial Vent Pipe—as vents, ducts, stacks for indoor or outdoor use in laboratories and industrial plants—is adaptable to practically any requirement. It is quickly and economically installed. It is light, strong and durable . . . is easy to assemble . . . can be worked with ordinary tools. It comes in sizes up to 36″ in diameter, and there is a complete line of fittings available for every need. For further details on Transite Pipe for your industrial venting problems, write to Johns-Manville, Box 60, New York 16, N. Y.

JM

*Transite is a registered Johns-Manville trade mark

Johns-Manville TRANSITE Industrial Vent PIPE

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Free NEW CATALOGS

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MEASURING & CONTROL

18 Indicators
You get the story on manually-operated indicators for temperature, conductivity and pH measurements in this 24-page catalog. Typical installation photographs. Circuit diagrams show how indicators operate. Specs for both indicators and accessories. Catalog No. ND42. Leeds & Northrup Co.

19 Control Accessories
Air pressure regulators, air filters, and pneumatic relays are among the many control accessories described in Catalog 8950. Diagrams illustrate control applications. Features and specifications. 18 pages. Minneapolis-Honeywell Regulator Co.

20 Meters and Controls
This 16-pager (Bulletin 17-E) gives you maker's complete line of instruments for metering and automatically controlling 17 process variables. Many illustrations and flow diagrams. Bailey Meter Co.

21 Air Valves
A complete line of air valves for a variety of applications are illustrated and described in this 36-page catalog. Included are solenoid-, foot-, and pilot-pressure-operated types. Catalog No. 53. Mechanical Air Controls, Inc.

22 Industrial Thermometers
Bulletin E-2 gives you technical data, construction features, and temperature ranges of industrial thermometers. Cut-away illustrations show design features and advantages. Scale tables and specs. 16 pages. Precision Thermometer & Instrument Co.

Turn the page

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Heavy loads seem lighter when carried on sturdy COLSON trucks. COLSON trucks handle easier, ride smoother and, therefore, move faster. Because less time is required for each load—handling costs are cut to the absolute minimum. Whether you require standard or special handling equipment, you can depend on precision built COLSON trucks to move materials easier and faster.

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- Aluminum four-bladed propeller type fan is accurately formed and balanced to deliver maximum volume of air quietly.

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IMPORTANT NEW Free CATALOGS

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MISCELLANEOUS

23 Fans
A 64-page manual to help you select equipment for plant ventilation and air movement. Many illustrations and diagrams show features and advantages. Helpful tips on mounting, maintenance and lubrication. Ratings tables, dimensions, and specifications. No. 20-A. Aerovent Fan Co.

24 Lubricants
"The Brooks Oil Story" is the title of this 20-page booklet. Describes lubrication products, manufacturing facilities. Tells how to select and outlines services offered. The Brooks Oil Co.

25 Water and Sewage Treatment
Catalog 61 describes a solution-feed, dry-vacuum type chlorine dispenser. Illustrations of component parts and diagrams of chlorine dispenser installations. Section on maker's other water and sewage treatment products. 12 pages. Fischer & Porter Co.

26 Steel Strapping
A 12-page folder to help you with your packaging problems. Illustrations show various methods of strapping for easy handling of pallet loads. Catalog No. SPD 92. Signode Steel Strapping Co.

27 Boiler-Burner Unit
An oil, gas, or oil and gas combination pressurized boiler-burner unit is described in Bulletin B-3133. Cut-away illustrations give features and advantages. 14 pages. Titusville Iron Works Co. & Iron Fireman Mfg. Co.

28 Industrial Chemicals
Gives you the story on many industrial chemicals used today. Describes their properties and suggests applications. Catalog No. D-2794. 16 pages. The Harshaw Chemical Co.

For catalogs 29 through 47, see Plant Engineering Problems, page 284, and Plant Operating Problems, page 288.

DUPLICATE COUPON ON PAGE 158

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FACTORY MANAGEMENT & MAINTENANCE (October, 1953)
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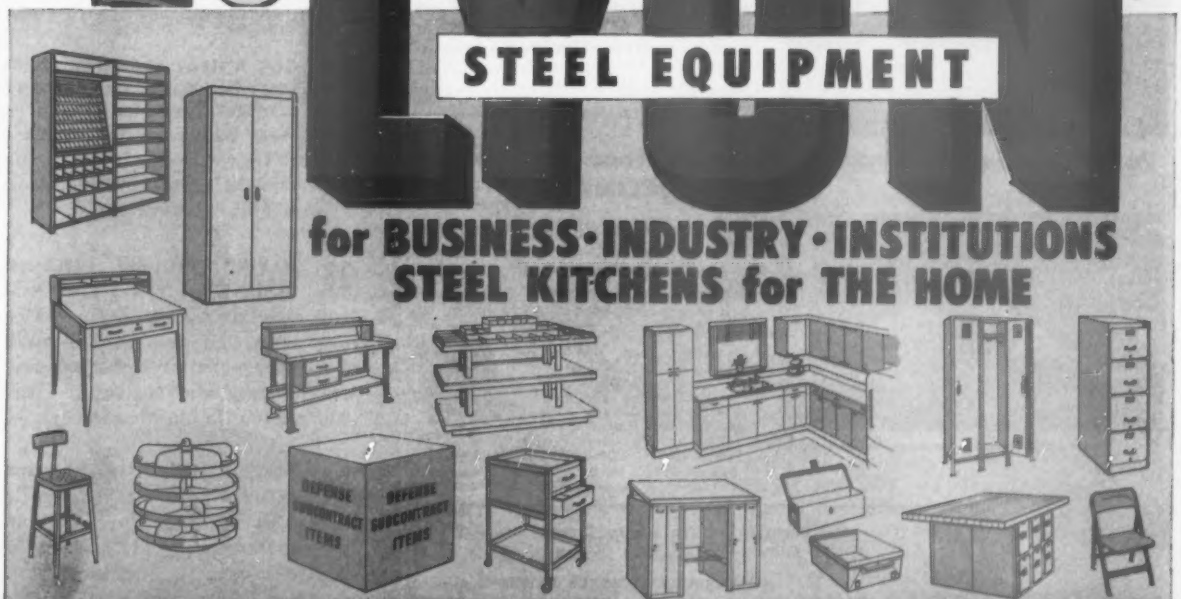

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CONVEYORS

ROLLER • BELT • SLAT • CHAIN • WHEEL
PUSH-BAR • SECTIONAL
PORTABLE CONVEYOR UNITS:
HANDIBELT • HANDIPILER
INCLINEBELT • LEVEL BELT • EXTENDOVEYOR
UTILITY BELT-VEYOR • HANDI-DRIVE
VERTICAL LIFTS • PNEUMATIC TUBE SYSTEMS

Good Ways to Solve Special PLANT ENGINEERING PROBLEMS

To get these catalogs, circle numbers on coupon, page 158 or 282.

29 HOW TO ACID-PROOF A CONCRETE FLOOR: Protect the surface with Phenoline 300 says the Carboline Co. in its Bulletin A-50. It gives applications and limitations of this unusual surfacing material. Bonds equally well to old and new concrete.

30 WILL DEHUMIDIFICATION SOLVE YOUR HUMIDITY PROBLEM? Answers to this question are briefed in 4-page Bulletin 374 of the Abbeon Supply Co. dealing with the basic causes and cures of humidity conditions.

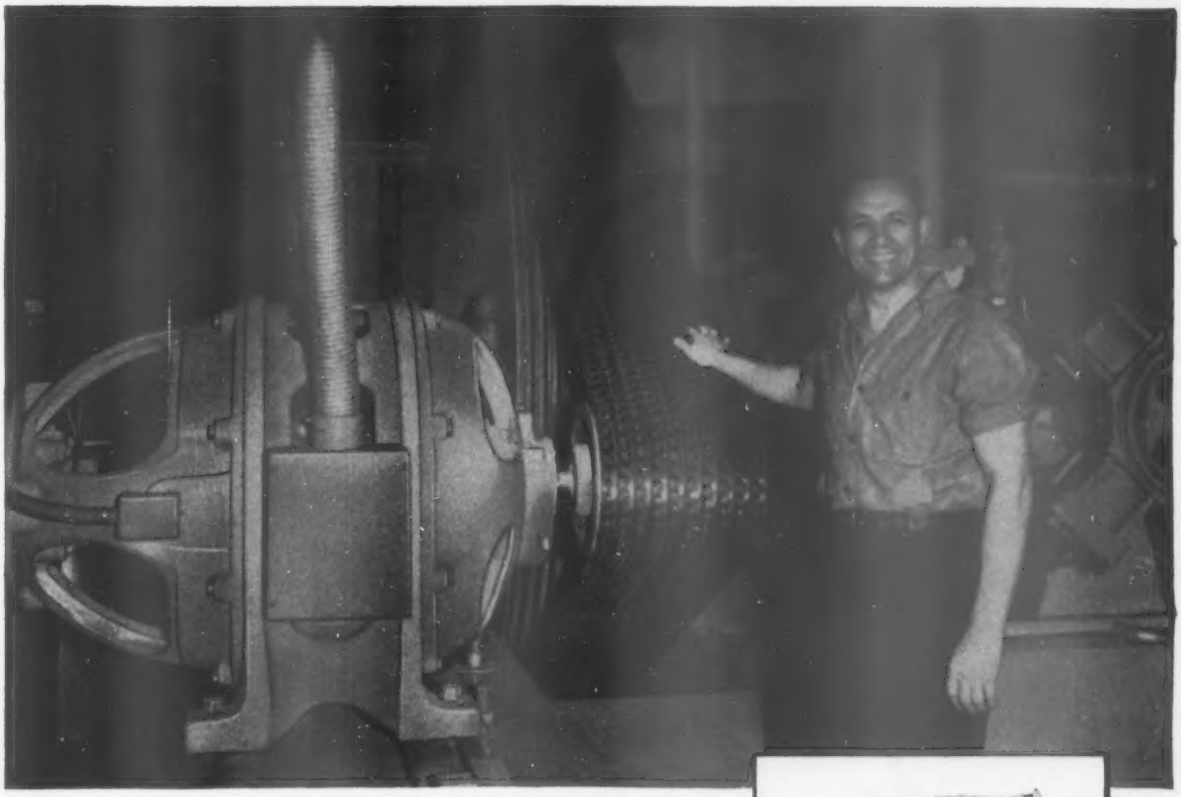
31 HOW TO DOLE OUT LIQUIDS ACCURATELY BY REMOTE CONTROL: Automatic, push-button system devised by the Buffalo Meter Co., will save time and eliminate errors in dispensing liquids, oil, and many other corrosive chemicals. Moderate cost.

32 GOT A HEAT TRANSFER PROBLEM IN YOUR PROCESSES? You can get high temperatures with low pressures with Dowtherm. Dow Chemical Co.'s 16-page booklet gives 10 other good applications of Dowtherm.

33 HAVING TROUBLE WELDING STAINLESS STEELS? The General Electric Co. Bulletin GET-1955 is an 8-page practical guide for getting better results when arc welding martensitic, ferritic, and austenitic stainless steels.

34 TO CLEAN AND TONE UP YOUR ZEOLITE SOFTNERS: Sprinkle bed with Zeotone, says Calgon, Inc. Loosens iron, silt, and other material deposits, and acts as a sterilizing agent and rust inhibitor.

Turn the page



with Veelos on your machines...

v-belt replacement takes up to 90% less time

Actual in-plant records prove that Veelos v-belt can be installed *and operating* in up to 1/10th the time regularly needed to do the same job using endless v-belts.

Matched sets of Veelos are quickly made up in your own stockroom or at the machine by just coupling the correct lengths for the particular drive. Even outboard bearing drives are no problem. You *never* remove these outboard bearings, because Veelos is installed by simply coupling it around the shafts and running it onto the sheaves. And maintaining adequate stocks of Veelos is practically automatic. A quick check of the Veelos 100-foot reel will tell the inventory story.

For full vibrationless power delivery, for fast adjustability to keep sets matched, for ease of controlling inventory and for quick, simplified replacement — standardize on Veelos.

Have you seen this Veelos Facts Book?

Your Veelos v-belt distributor's salesman will be glad to give you a quick trip through this fact-packed, 36 page book. You'll find it well worth the few minutes it takes. Next time the salesman calls, ask him to show it to you.

VEELOS
THE LINK
V-BELT

Write for a copy of the VEELOS DATA BOOK. It's fully illustrated and packed with useful engineering data. We'll be glad to send a copy along and you'll be glad to have it!

MANHEIM MANUFACTURING AND BELTING COMPANY
604 Manbel St., Manheim, Pa.

ADJUSTABLE TO ANY LENGTH • ADAPTABLE TO ANY DRIVE

The RIGHT SELECTION pays off in Grinding Wheels too!

SIMONDS ABRASIVE CO.

Grinding Wheels

In buying wheels . . . as in hiring men . . . intelligent selection pays off in production. Simonds offers you productive grinding wheel selection in three ways: (1) through our free data book with wheel specifications for all your grinding jobs . . . plus information on Simonds complete line, including grinding wheels, mounted wheels and points, segments, polishing grain: (2) through Simonds field engineering service, ready at any time to help you get wheels for your specialized jobs: (3) through your Simonds distributor—constantly abreast of the latest developments in industrial grinding,and equipped to supply you promptly with Simonds wheels for superior results.

Write for data book and name of your Simonds distributor.

SIMONDS ABRASIVE CO., PHILADELPHIA 37, PA. BRANCH WAREHOUSES: CHICAGO, DETROIT, BOSTON

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Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N.Y. Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que

Begins on page 284

Good Ways to Solve Special

PLANT ENGINEERING PROBLEMS

To get these catalogs, circle numbers on coupon, page 158 or 282.

35 HOW TO CUT THE COST OF RADIANT HEAT FLOORING: If you use Heatcrete aggregate in your concrete mix, says Lee-Don, Inc., you will increase the thermal conductivity of the slab. Illustrated booklet shows how you can use 25% less pipe, without reducing total heat output.

36 NO MORE SCRAPING AND PAINTING HOT WATER TANKS says Metalweld, Inc., if you line them with Metalweld Plasticote. This internal ¾-in. lining is nonporous, insoluble, and eliminates rust. Can be applied in 24 hours.

37 HOW TO CLEAN OUT OIL SUMPS and coolant reservoirs in a few minutes: Bulletin 600 of the Breuer Electric Mfg. Co. shows how accessory tools plus a heavy-duty Tornado vacuum cleaner do this and other tough industrial cleaning jobs.

38 ARE YOU SELECTING THE RIGHT ALLOY FOR YOUR HARD FACING JOBS? If your hard facing isn't getting the desired results, you can probably find out what's wrong from Bulletin AR53-20 of the Alloy Rods Co. Contains 12 pages of how-to-do-it information on the correct electrode or rod to use on about 75 types of hard-facing problems.

39 HOW TO PREVENT NEEDLESS FUSE BLOWING, arcing, and heating at contacts, is the subject of Bulletin No. 6 of the Trico Fuse Mfg. Co. Tells of many uses for Kliploks to safeguard electrical circuits, thus preventing downtime and reducing fire hazard.

Turn the page

Parlon Stays On!

Long-term protection against chlorine and moisture...

Mr. R. E. Ferguson, Master Mechanic at Southland Paper Mills, Lufkin, Texas, inspects wet end of Fourdrinier machine—protected with one coat of Parlon for twelve months. Parts in center have been wiped free of pulp to show excellent condition. This Parlon paint is Nepco Durechlor, Southland Green #5310—applied over one coat Nepco Red Oxide Metal Primer #1557, both made by Nepco Paint & Varnish Co., Inc.

(Above) Metal railing and catwalks at O. M. Base Paper Co., Reserve, Virginia, Pa., finished with two coats of Parlon paint applied in 1950. Paint is still in excellent condition, despite condensation from live steam from pulp in area below. This Parlon paint is known as Tornesit, made by Perry-Austen Mfg. Co., Staten Island, N. Y.

(Above) At Scott Paper Company, Everett, Washington, four coats of a Parlon paint show average service life of eight years on wooden bleach roll tubes in fast-vegetable house. Parlon paint used is known as Parlon, made by Parlon Paint Company—a subsidiary of Rodda Paint & Varnish Co., Seattle, Washington.

In paper mills, where moisture and chemicals are constant enemies of processing equipment, paints made from Hercules Parlon (chlorinated rubber) are doing a remarkable job of cutting maintenance costs. Often they obviate installation of costly corrosion-resistant materials. Even chlorine finds its match in Parlon.

Parlon is easy to apply and serves equally well on metal, concrete, wood, and special surfacings. It dries almost as fast as lacquer, and is highly resistant to wear and abrasion as well as to acids and alkalies.

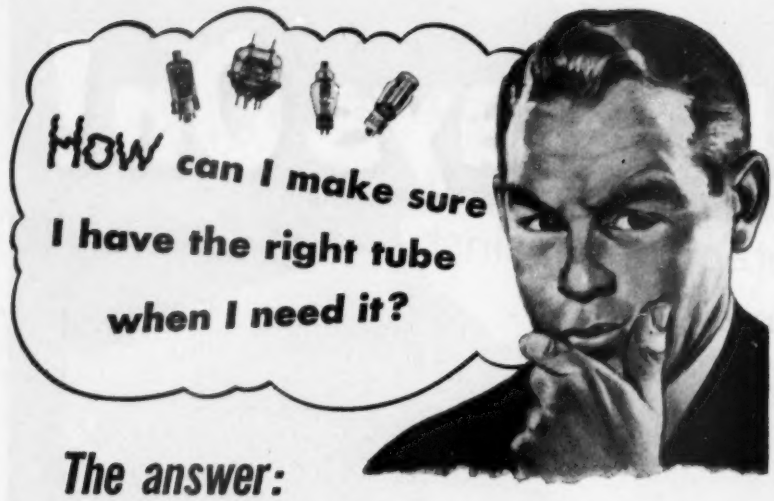
If corrosion is a particular problem with you, specify "paints made with Parlon." In paper and textile mills, chemical plants, refineries, sewage disposal plants, and water works, ships, and railroads . . . Parlon gives better service at lower long-term costs. See your regular supplier for details on Parlon-based paints or write Hercules.

Cellulose Products Dept. HERCULES POWDER COMPANY *905 Market St., Wilmington 99, Del.*

LOOK FOR THIS LABEL ON THE PAINT CAN...

MADE WITH Parlon® HERCULES® CHLORINATED RUBBER

PARLON CHLORINATED RUBBER PAINTS ARE AVAILABLE FROM AND MANUFACTURED UNDER THESE EXPERT PAINT BRANDS



The answer:

RCA's new Tube Requirement Analysis!

Now you can stop worrying about the possibility of a costly production shut down—in the event you have neglected to reorder a key tube type. Now you can also save money by avoiding "overstocks." RCA's new Tube Requirement Analysis gives you smooth control over your industrial tube requirements.

Get in touch with your RCA Tube Distributor

Give him all the information you can about your electronic equipment, the tube types involved, and your special requirements. In this way, you bring him up to date on the services in which your tubes are operated.

He analyzes your needs

—Then your RCA Tube Distributor can prepare a record of movement on each tube type required for your equipment—can study *your* specific tube requirements.

He recommends a plan for YOU

Now, your RCA Tube Distributor presents a tube inventory plan—simplified and "tailored" specifically to your operations. He keeps up to date on your inventory . . . and backs it up with inventory service on his end, too! No overstocking. No shortages. Yet you can be sure you have the right tube—when you need it!

RCA's new Tube Requirement Analysis is available exclusively through your local RCA Tube Distributor. Call or write him, today. There is no charge or obligation for this service.

RADIO CORPORATION of AMERICA
ELECTRON TUBES
HARRISON, N.J.

Good Ways to Solve Special

PLANT ▶ OPERATING PROBLEMS

To get these catalogs, circle numbers on coupon, page 158 or 282.

40 **FOR BETTER WAYS TO LIFT,** try hydraulic lifts, suggests Wayne Pump Co. Application ideas for loading docks, cross-over bridges, platform lifts, and truck service lifts are in this 16-page brochure No. WL.

41 **HOW TO CUT SOFT MATERIALS** into uniform sheet size at low cost: Hobbs Mfg. Co. says its automatic production cutter is ideal, will cut paper, plastics, cloth, and other materials. Electronic device controls cut to predetermined length. Adaptable to almost any in-line production machine, according to Form 201.

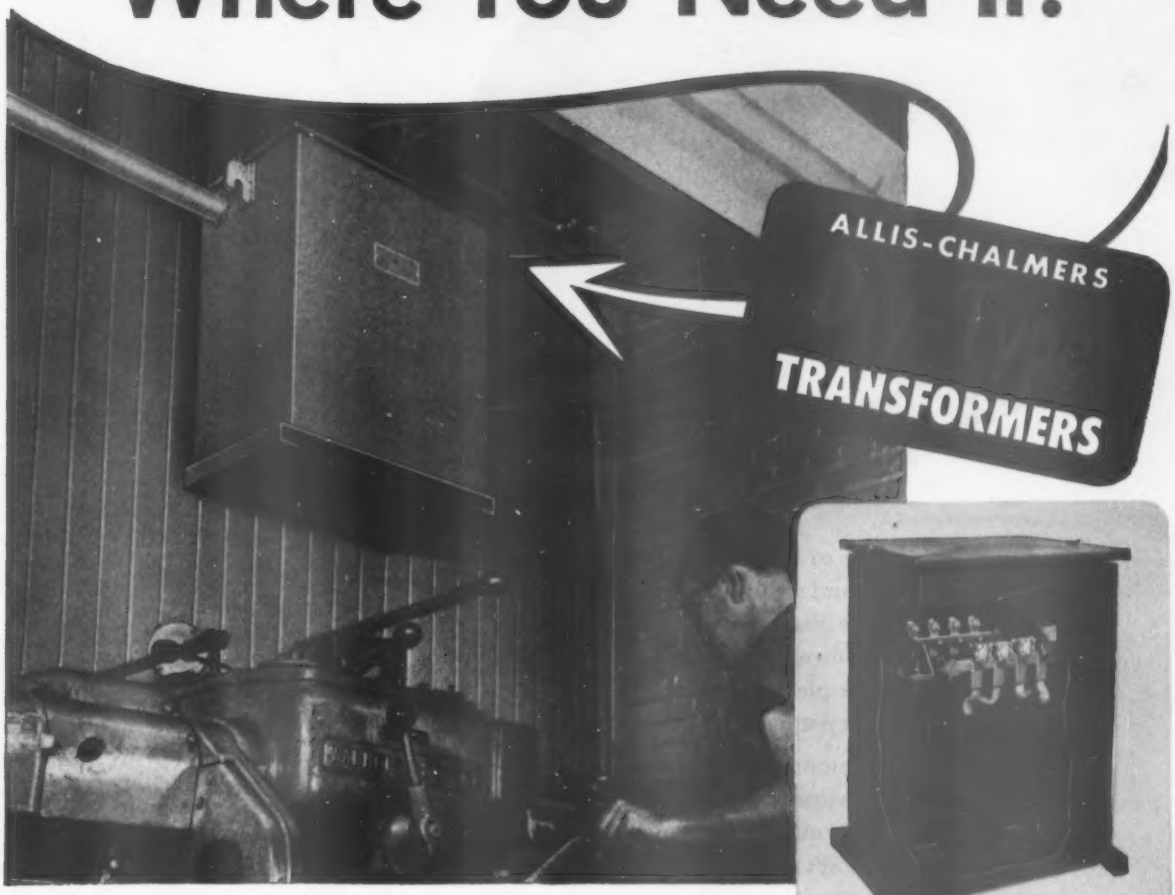
42 **WANT TO CUT BUFFING COSTS UP TO 40%?** Its air-operated buffing compound applicator does the trick, says George L. Nankervis Co. It features a variable number of applications per minute, will accommodate rectangular or round compound bars. And the light-weight unit can be installed on all types of buffing machines.

43 **FOR LESS OVERHEAD CONVEYOR MAINTENANCE,** Cable-Link Corp. has developed its cable conveyor system. There are no moving parts below the rail and very few other bearing points. And system operates on a low friction which also makes the conveyors low on power consumption. Folder illustrates three models available for light, medium, and heavy-duty applications.

44 **TO SEAL SLIP COVER CANS FASTER** and more economically, says E & R Co., take a look at its new packaging machine.

Turn the page

PUT POWER Where You Need It!



HERE'S THE WAY to assure rated voltage for motors and other equipment. Install Allis-Chalmers dry-type transformers close to the load to provide full voltage for efficient motor operation, flicker-free lights, and full heating of thermal equipment.

You can mount them anywhere, on posts, beams or walls, in a small amount of space, or right on the machine itself. You don't need vaults or expensive enclosures.

Installation is easy because junction boxes are eliminated. Knockouts are provided for connecting conduits directly to the transformer case. System cables are connected to the transformer terminals in compartments.

Maintenance is easy, too. You install Allis-Chalmers transformers and forget them except for periodic inspections. There are no insulating liquids to maintain; no gauges or gaskets to fuss with.

Get more information from your Allis-Chalmers district office, or write Allis-Chalmers, Milwaukee 1, Wis.

A-3980

IT'S ENDURANCE BUILT

Core and coil assembly is impregnated to guard against moisture and dirt. All-welded, modern looking case protects the internal assembly. Case is Spra-Bonderized to protect it against corrosion. Three coats of baked-on alkyd resinous paint furnish additional protection.

Ratings 167 kva and smaller (single phase); 300 kva and smaller (three phase); 600 volts and below.

ALLIS-CHALMERS

with KEX wiping towels...

"I decided long ago to stop buying scrap rags and waste by the pound and switch to Kex wiping towels because a lot of the stuff we were getting wasn't usable. It had no uniformity and the men had to pick and choose the right piece for every job. That isn't true with Kex—every square inch is usable.

"After the first few months of using Kex Service my month-end cost for wipers was down substantially! The men have a uniformly-sized, absorbent towel for every job. And we don't run the risk of scratching or damaging delicate precision machinery."

YOU DON'T BUY A THING—just pay a low monthly rental. Kex towels are distributed nationally—for complete information, see your Classified Telephone Directory for nearest Kex distributor, or write Kex National Service, 295 Fifth Avenue, New York 16, N. Y.

"KEX" NATIONAL SERVICE

REG. U.S. PAT. OFF.

It isn't Kex unless it's imprinted with the Kex name

Begins on page 288

Good Ways to Solve Special

▶ PLANT OPERATING PROBLEMS

To get these catalogs, circle numbers on coupon, page 158 or 282.

It's designed for automatic volume sealing with pressure-sensitive tape. You can apply complete seals at better than 900 cans per hour. Machine handles cans from 2 to 10 inches in diameter, from 1 to 12 inches high. Built to fit into existing conveyor set-ups.

45 **NEED A CONVEYOR THAT STOWS ITSELF?**—Well practically. Aluminum gravity conveyors announced by Speedways Conveyors, Inc., are up to two-thirds lighter than steel types, can easily be lifted to overhead storage racks when not in use. Bulletin shows how.

46 **FOR IMPROVED CLEANING AND PEENING,** why not try Wheelabrator steel shot, says American Wheelabrator & Equipment Corp. Bulletin No. 89 illustrates factors important to economical and efficient consumption of steel shot abrasive, tells how to perform your own abrasive tests under actual operating conditions.

47 **FOR FEEDING BULK MATERIALS IN VACUUM PROCESSING** without stopping the operation, you can use the Collins-Adey differential pressure feeder. It's mechanically operated and moves material by gravity or mechanical means through an intermediate pressure lock from one pressure to another. Gates and chokes open automatically, flow is continuous. You can move the materials from high-vacuum to atmospheric pressure—or feed at atmospheric pressure up to 10,000 psi.

At this very moment, hovering over your plant, fire is ready to swoop down on storage spaces, electrical generating equipment, record vaults. But like a bird of prey, it casts a warning shadow... IF you have a KIDDE Industrial Smoke Detector.

Kidde

Walter Kidde & Company, Inc.
1032 Main Street, Belleville 9, N. J.
Walter Kidde & Company of Canada, Ltd., Montreal, P. Q.

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(And—in addition—passenger and freight representatives at all Union Pacific Railroad stations will be glad to assist you.)

BE SPECIFIC "SHIP" UNION PACIFIC

Original and Genuine

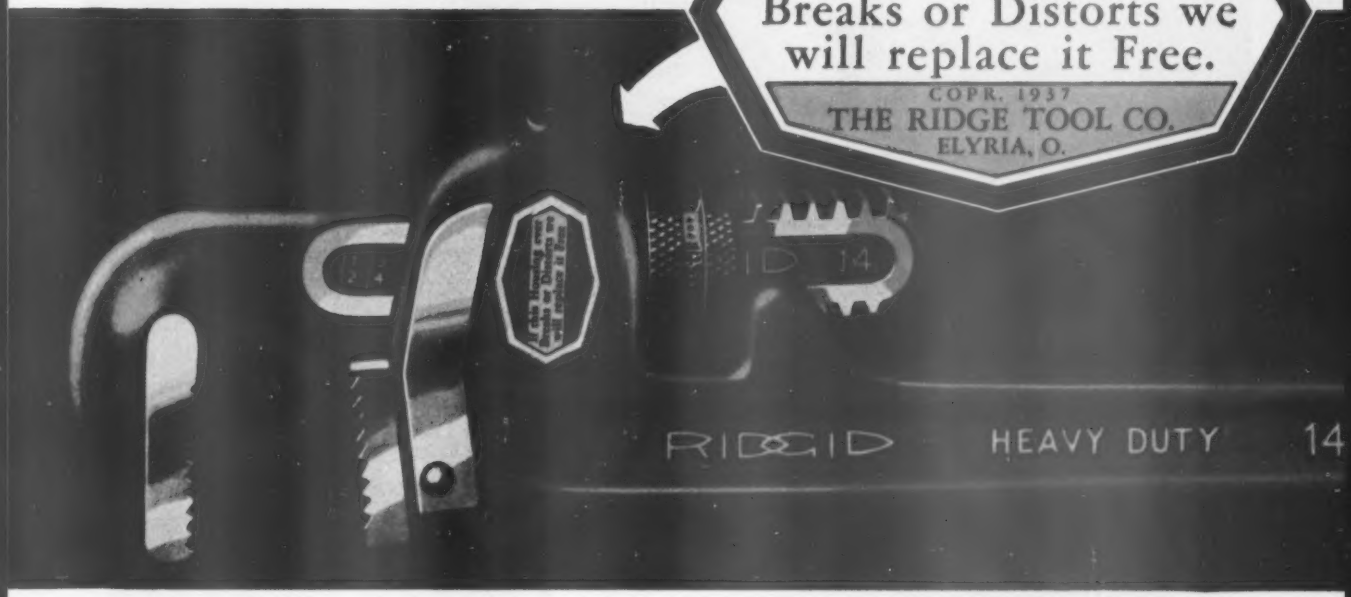
RIDGID

HEAVY-DUTY PIPE WRENCH

Read this guarantee —on millions of RIDGID wrenches sold to date.

1st with guaranteed housing—
still the only one!

★
UNCONDITIONAL GUARANTEE
If this Housing ever Breaks or Distorts we will replace it Free.
COPR. 1937
THE RIDGE TOOL CO.
ELYRIA, O.



1st *with replaceable jaws*—non-slip, non-lock, instant grip on pipe.

1st *with adjusting nut in open housing*—always spins easily to pipe size, 6″ to 60″.

1st *with handy pipe scale* on hookjaw.

1st *with comfort-grip I-beam handle*—with handy hang-up hole.

1st *with end pattern pipe wrench*—for pipes crowded or against flat surfaces.

No wonder RIDGID is the world's most popular pipe wrench. Buy genuine RIDGID's for easier work and extra economy—at your supply house.

THE RIDGE TOOL COMPANY, ELYRIA, OHIO, U. S. A.

RIDGID

Work-Saver Pipe Tools · · Most Popular in the World

HERE'S AN IDEA FOR INTER-PLANT HANDLING...

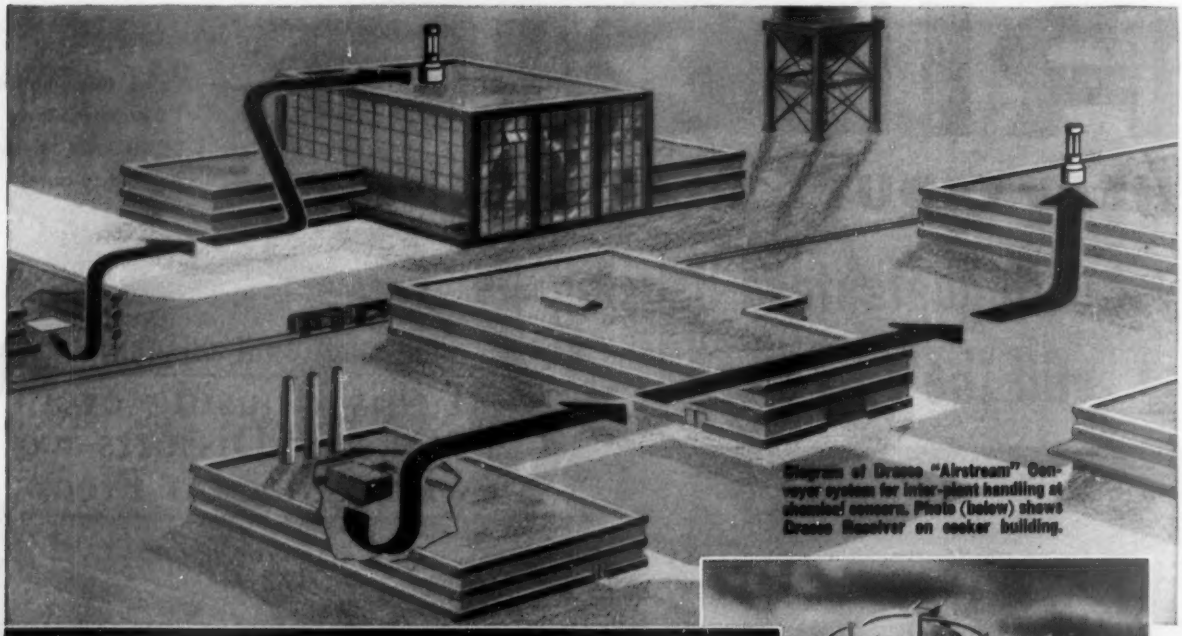
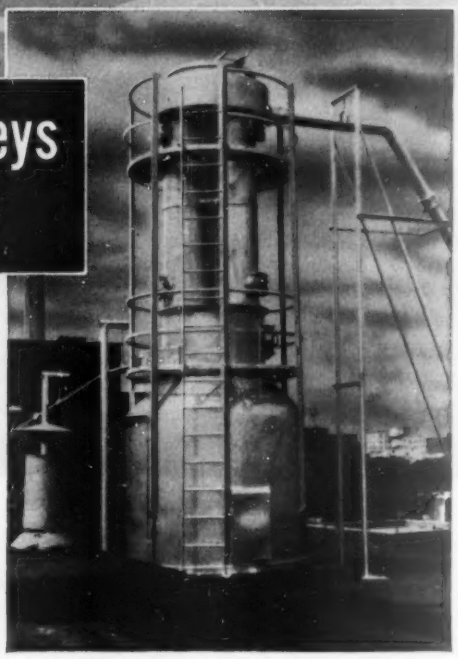


Diagram of Dracco "Airstream" Conveyor system for inter-plant handling at chemical concern. Photo (below) shows Dracco Receiver on cooker building.



Fast, Flexible *Airstream* Conveys Bulk Materials Efficiently

● Bulk granular materials can be transported *between* plants better, faster and at less cost with automatic Dracco "Airstream" Conveyors.

Dracco "Airstream" systems are profit-engineered and produce major dollar savings in labor, materials and over-all plant efficiency. Height, distance and existing facilities present no obstacle to this modern, high-speed technique.

The "Airstream" system recently installed at an Illinois plant producing biochemical feed supplements illustrates the advantages of this method. Two positive-action conveyors perform two distinct handling functions:

(1) Granular raw materials are conveyed 250 feet from warehouse to cooker building for fermentation.

(2) Dried, ground antibiotic feed supplements are moved 700 feet from feed plant to blending building.

The result is inter-plant handling that is sanitary, and economical.

Why not investigate how "Airstream" Conveying can cut your inter-plant handling costs? Call in a Dracco engineer—today!

DRACCO CORPORATION
4075 East 116th Street · Cleveland 5, Ohio

UNI-FILTERS · ELECTRIC TIMERS · WHIRL-CLONES · INDUSTRIAL FANS · FEEDERS AND LOCKS · MULTI-BAG FILTERS

DRACCO

Performance Proved

Airstream CONVEYORS · DUST CONTROL EQUIPMENT

For Maximum Branch Circuit Protection

INSTALL FA NQP QUICKLAG P *Circuit Breaker* PANELBOARDS

THE LATEST FA contribution to more flexible and efficient branch circuit protection . . . panelboards that are not only safe, dependable, long-lasting and trouble-free but have the added advantage of providing adequately for today's electrical needs as well as future requirements.

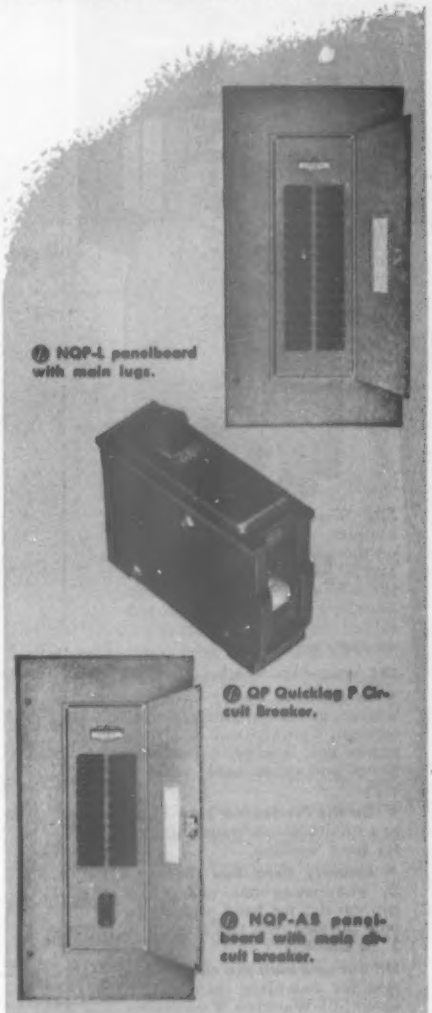
Small and compact, these new and improved panelboards feature the new FA QP Quicklag P Circuit Breaker with thermal magnetic overload protection and manual or automatic quick-make and quick-break operation.

FA NQP Quicklag P panelboards are available in eleven sizes of enclosures — six with main lug connection and five for main circuit breaker connection, 50 — 225 amp capacity. These, plus a stock of individually packed single and double pole FA QP Quicklag P circuit breakers will fit any job requirement. Because all circuit breakers are interchangeable, it is easy as replacing a light bulb to make changes or add new units.

Install these panelboards on all your branch circuits. You'll find that they will virtually pay for themselves in efficiency and service. For additional information, contact your nearest FA representative, listed in Sweet's or your contractor or wholesaler.

FA NQP QUICKLAG P FEATURES

1) **Quick-make and quick-break operation manually or automatically on harmless overloads, short circuits or severe overloads. Handle position indicates "tripped."**
2) **Quick restoration of service simply by moving handle to "off" and then to "on" position.**
3) **Screwless assembly (*just slip breakers in*) with one pressure type connection between circuit breaker and bus bar.**
4) **"Sequence bussing" to balance the load and permit double pole, individual trip combinations.**
5) **Boxes only 14" wide with 4" gutters.**



FA NQP-L panelboard with main lugs.

FA QP Quicklag P Circuit Breaker.

FA NQP-AS panelboard with main circuit breaker.

CAPACITIES: 15, 20, 30, 40 and 50 amps; 120 volts, single pole or 120/208 volts, double pole, individual trip; 4 to 42 poles; 120/240 volts, 3 wire single phase or 120/208 volts; 4 wire three phase mains with lugs only or main circuit breaker.

Frank Adam Electric Co.

P. O. BOX 357 ST. LOUIS 3, MISSOURI

Makers of: BUSDUCT • PANELBOARDS • SWITCHBOARDS • SERVICE EQUIPMENT • SAFETY SWITCHES • LOAD CENTERS • QUIKHETER

NEW SBS WATERLESS WASHSTATION*

"brings the washroom to the worker"*

for only $52.50 per unit

(F.O.B. Saginaw, Mich. Towel Dispensers not included)

SBS Waterless Washstations are complete units for hand washing on the job. Because they dispense SBS-30 Waterless Skin Cleanser, these Washstations require no plumbing . . . SBS-30 is simply rubbed on the hands and wiped off along with all the soil.

SBS Waterless Washstations—

- **In Trouble Spots** — Avoid workers use of irritating, harmful solvents. Quickly and safely removes tars, greases, paints, varnishes and other hard-to-remove soils.
- **On the Production Line**—Cuts to a minimum costly interruptions for hand washing.
- **Actually Earn You Money**—By eliminating one unnecessary trip per day for hand washing by only 10 men, you can save up to $720 annually.

Fill out and mail the coupon below for complete information about SBS Waterless Washstations and our 30-day no-risk money back trial offer.

*Trademark

SUGAR BEET PRODUCTS CO., Dept. 7H, SAGINAW, MICHIGAN

Sirs: Please send me full information about the new SBS Waterless Washstation and your 30 day no-risk money back trial offer.

NAME_____

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COMPANY_____

CITY_____ ZONE____ STATE_____

SUGAR BEET PRODUCTS CO. • Saginaw, Mich.

Chemical By-Products Division

Aeroquip says:

Production Control Is The Best Place to Train College Grads

Why? Because there they learn fastest that "production is not a surprise, but the result of careful planning and getting things done." That's a good philosophy to live with in a company.

By MATTHEW BETLEY
Vice President, Manufacturing
Aeroquip Corporation
Jackson, Mich.

The Problem:

Like most companies that are expanding fast, we have the problem of filling many supervisory and second-level executive jobs that open up yearly. For some time we've been:

1. Hiring for training top-quality college graduates who appear to have the potential to move up, ultimately, to executive positions;

2. Training men from the shop who appear to have this same potential, despite their lack of formal education.

While we've never had a formal training program, we have been making extensive use of the production control department for this training.

Of course we don't consider production control the only good training ground. Graduate engineers with some practical experience are often placed in industrial engineering or even production jobs, without going through the program outlined here. This plan is used largely for trainees who have a background in business administration or industrial engineering, particularly those without practical experience.

Why Production Control?

TRAINEES REALLY WORK · In the first place, we can't afford to have a lot of college graduates on the payroll who are merely "in training." We want our trainees to be doing productive work. From this point of view, starting them in production control is ideal. Here's why:

Once a good system of production control is set up, the work flows through in a routine manner. As soon as an intelligent trainee is familiar with the routine, he is capable of handling most of the work that comes to the department. He need come to his supervisor only for the solution of exceptional problems.

TRAINEES GET AN OVER-ALL PICTURE · We want our trainees to be able to fit into a wide variety of supervisory or staff jobs, with a minimum of on-the-job instruction. So we feel each trainee should have a broad knowledge of all departments in the shop. He should be familiar with production, and the steps that must be taken to get a product out the back door.

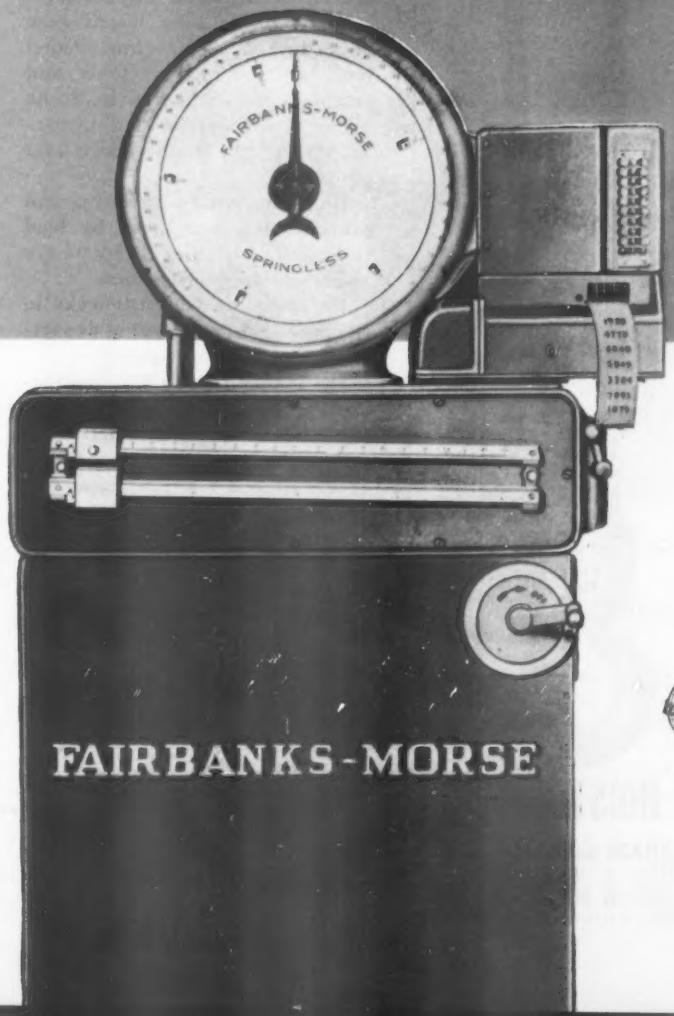
Production control is the best place, we think, to get this broad knowledge. There is scarcely a function of the company that doesn't tie in. Here are some examples:

A production control man has for raw materials blueprints from the design department,

1938
4770
6848
2949
3384
7893
1070

Keep your weights a matter of record

Automatically!



Rule out the chance for weighing errors with a Fairbanks-Morse Dial Scale with Printomatic Recorder. You save annoying, costly receiving and shipping disputes—you have a permanent record of each article weighed *automatically!*

The Printomatic is designed so that other pertinent information may also be printed with the weight for accounting or identification purposes. And, there's an electronic control for materials handling and processing.

See your local Fairbanks-Morse Scale Specialist about the Printomatic Recorder . . . and his complete line of scales of all types. Fairbanks, Morse & Co., Chicago 5, Illinois.

FAIRBANKS-MORSE

a name worth remembering when you want the best

SCALES • PUMPS • DIESEL LOCOMOTIVES AND ENGINES
ELECTRICAL MACHINERY • RAIL CARS • HOME WATER
SERVICE EQUIPMENT • FARM MACHINERY • MAGNETOS

In Every Department

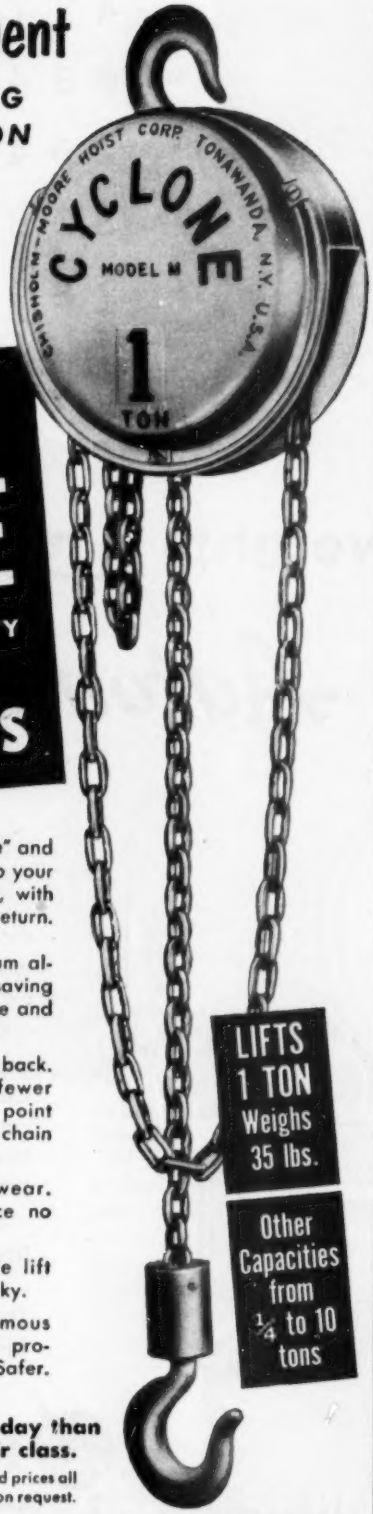
RECEIVING
PRODUCTION
STOCKROOM
MAINTENANCE
SHIPPING

do the lifting with

CM CYCLONE

HIGH SPEED—HEAVY DUTY
ALUMINUM ALLOY

CHAIN HOISTS



HERE ARE ONLY 5 PLACES "where" and 5 reasons "why" CYCLONE Hoists can help your men get lifting jobs done safer, quicker, with less physical effort. Increase labor-dollar return.

PORTABLE—The lightest weight aluminum alloy hoist in America. Encourages time-saving use because it can be picked up with ease and carried anywhere.

EASY OPERATION—Saves muscle and back. Advanced construction features and fewer parts combine to reduce friction to a point where the CYCLONE is the most efficient chain hoist available.

LIFETIME LUBRICATION—Reduces wear. Prolongs hoist life. Efficient performance no longer depends on periodic oiling.

LOW HEAD ROOM—Highest possible lift where ceilings are low and loads are bulky.

"HERC-ALLOY" LOAD CHAIN—Famous "HERC-ALLOY" welded steel load chain provides complete flexibility. Non-kinking. Safer. Longer life.

More CYCLONE Hoists are in use today than any other aluminum hoist in their class.

BULLETIN No. 145 illustrates, describes and prices all CYCLONE Chain Hoist models. Copy sent on request.

CM HOISTS AND CHAIN

CHISHOLM-MOORE HOIST DIVISION

COLUMBUS McKINNON CHAIN CORPORATION

TONAWANDA, NEW YORK
DISTRICT OFFICES: NEW YORK, CHICAGO, CLEVELAND

PRODUCTION CONTROL...

Begins on page 296

job instructions from industrial engineering. Every day he's told what jobs have to be scheduled into the shop. He's bound to realize that these instructions are based on planning, and the planning is based on the forecasts of the sales department. Unless he is entirely without curiosity, he can hardly miss getting a good knowledge of the function of the departments producing his work.

Gradually, also, a man in production control cannot help but become familiar with the work of the departments to which his work flows. For example:

In controlling production, he finds out the effects of a parts shortage, caused by a large number of parts being scrapped or needing rework. So he learns the function, and importance, of quality control and inspection.

In scheduling, he learns how important it is that the needed tools (both machine tools and cutting tools) be available. So he learns the function, and importance, of both maintenance and tooling.

He learns what purchasing and procurement men mean by lead time, and why sales forecasts are important to procurement.

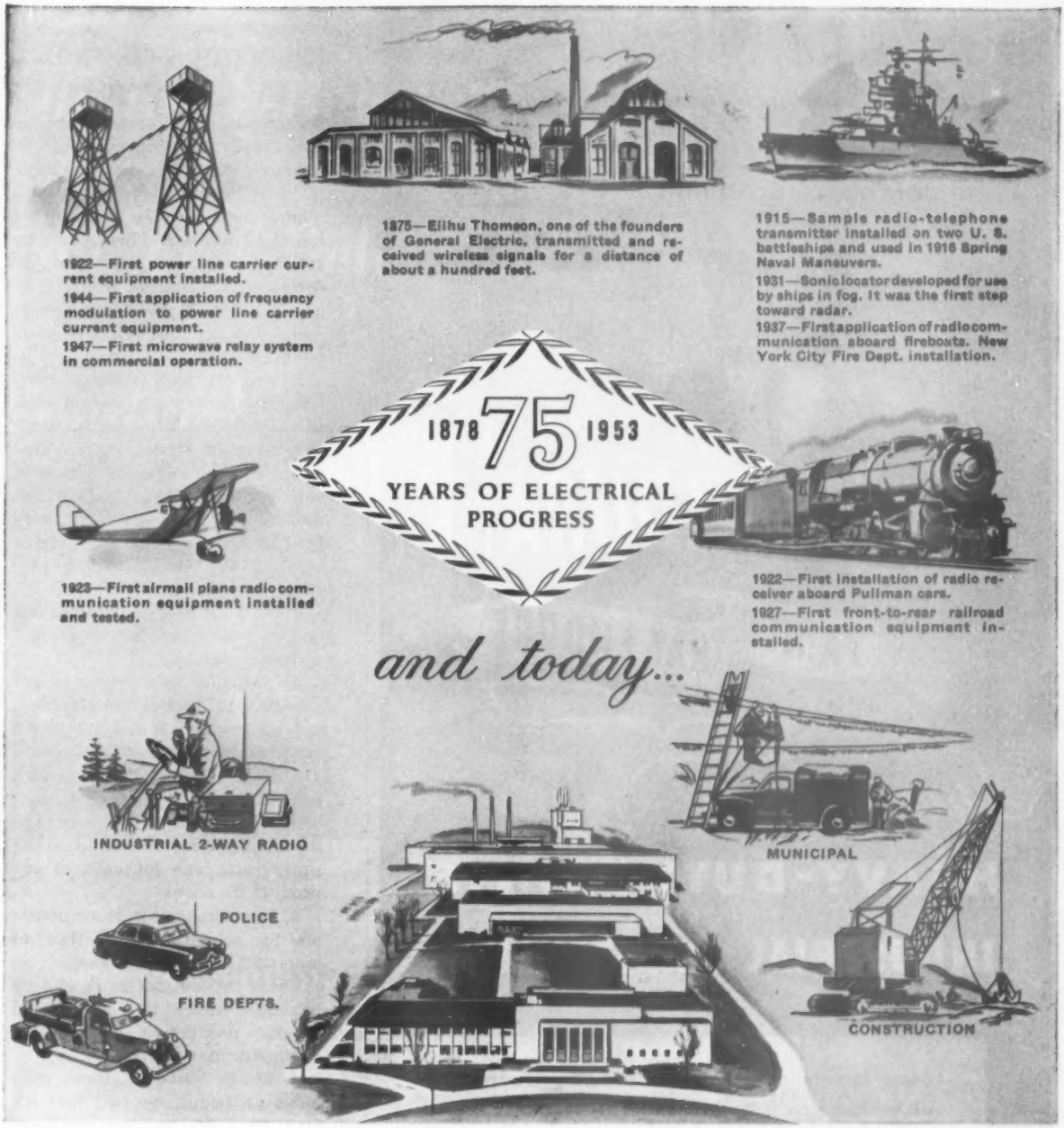
He learns what bottlenecks in the packaging or shipping departments can do to schedules.

He learns that while production is important, the company has to consider "production at what price." So he becomes aware of the need for budgets and cost control.

And when he's faced with idle capacity on his scheduling charts, he begins to get an insight into some of the financial considerations of production. He learns why the plant can't have enough tools to eliminate the juggling of machine loads he struggles with every day on his schedule sheets.

How the Trainee Develops

The number of trainees varies, depending on our requirements.


1922—First power line carrier current equipment installed.
1944—First application of frequency modulation to power line carrier current equipment.
1947—First microwave relay system in commercial operation.
1875—Elihu Thomson, one of the founders of General Electric, transmitted and received wireless signals for a distance of about a hundred feet.
1915—Sample radio-telephone transmitter installed on two U. S. battleships and used in 1916 Spring Naval Maneuvers.
1931—Sonic locator developed for use by ships in fog. It was the first step toward radar.
1937—First application of radio communication aboard fireboats. New York City Fire Dept. installation.
1878 75 1953
YEARS OF ELECTRICAL PROGRESS
1923—First airmail plane radio communication equipment installed and tested.
1922—First installation of radio receiver aboard Pullman cars.
1927—First front-to-rear railroad communication equipment installed.
and today...
INDUSTRIAL 2-WAY RADIO
MUNICIPAL
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FIRE DEPTS.
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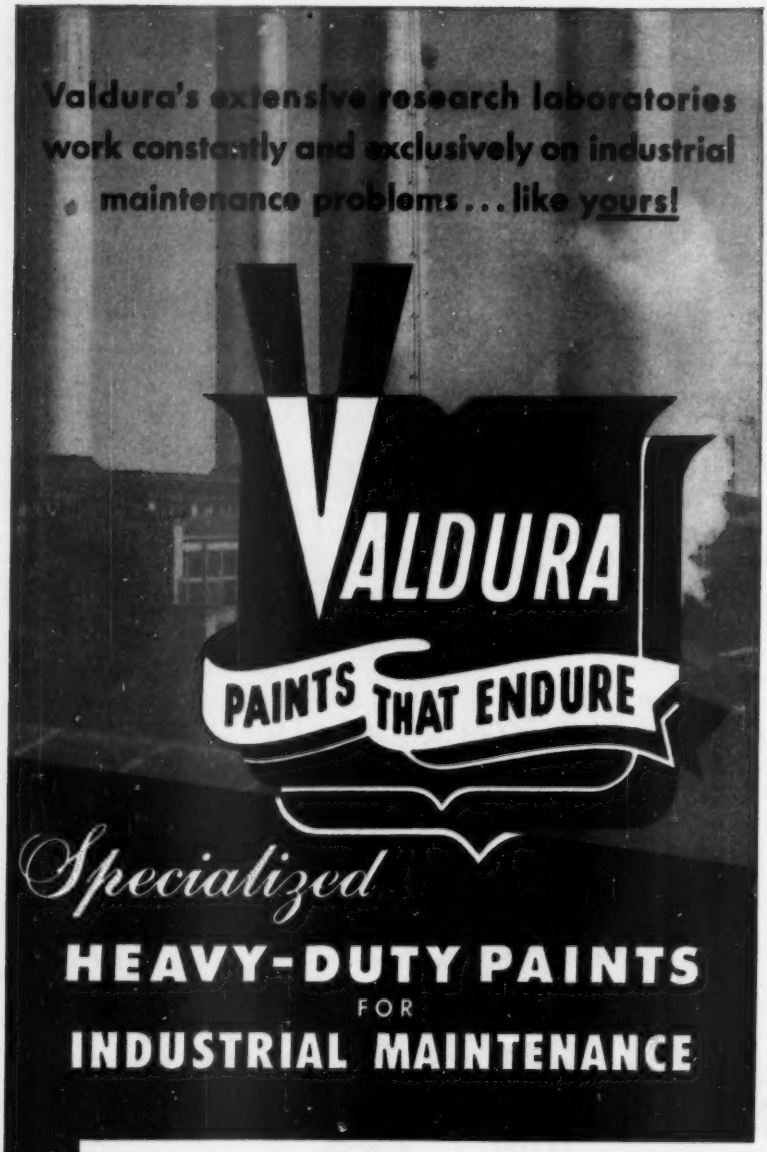
GE *Matchless Heritage* IN COMMUNICATIONS ENGINEERING

From the several companies formed to manufacture Edison's historic electric lamp, G.E. is today a company with 200,000 products . . . engaged in 13 of the 21 basic manufacturing industries. Its tremendous human and material resources are constantly working to give you a better life with new and improved products.

Communications in your business is the outgrowth of many G-E "firsts." Today — using G.E.'s *high-performance, low maintenance* radio units—industry, utilities, and municipal government reap these benefits: instant reliable communication for increased productivity . . . area control . . . citizen protection.

For information write: *General Electric Company, Section 65103, Electronics Park, Syracuse, New York.*

GENERAL ELECTRIC



Lower Maintenance Cost Is Valdura's Guarantee!

All Valdura products are SPECIFICS . . . engineered *not* to give you the lowest cost per can, but the *lowest cost per job* based on the fundamentals of performance, long life, and saving of labor.

If you'd like to know more about Valdura's complete line of specialized maintenance products, or if you'd like help with a particular problem, just state your wishes on your regular letterhead and mail to the address below. Your inquiry will be treated as an invitation to provide service . . . not as a license to exert selling pressure!

VALDURA PAINTS THAT ENDURE

VALDURA HEAVY DUTY PAINT DIVISION

AMERICAN-MARIETTA CO.

101 E. Ontario St., Chicago 11, Ill.

PRODUCTION CONTROL...

Begins on page 296

Sometimes we have only one or two a year. It's important not to have too many, because you have to have jobs to move them into, where they can use their new-found knowledge. They won't be satisfied long with a routine job in production control. And if they aren't satisfied, some other company may get the benefit of your training.

During the past year our company (with 600 employees) took in 12 trainees. They began work as production clerks, keeping entirely routine records. We kept each one on this job for about two months—long enough to familiarize him with department routine but not long enough to bore him stiff.

From there he graduated to one of two jobs: planning supervisor or flow supervisor.

A planning supervisor is responsible for production planning, ordering materials and purchased subassemblies from the purchasing department, follow-up with purchasing and materials control, and releasing work orders to the shop. We have three planning supervisors, one for each of our product divisions.

A flow supervisor is responsible for scheduling and flow of materials through the shop.

These supervisors work closely together, under the supervision of our production control department manager.

Although some of these men move on faster, we feel that it's ideal to keep trainees on these jobs for at least a year, to acquire the knowledge of other departments we want them to have.

Training in Human Relations

In addition to learning about plant operations, our trainees need ability to handle people. To develop this talent we promote our trainees from planning supervisors and flow supervisors to the foremanship of an indirect department.

Of our 12 trainees over the past

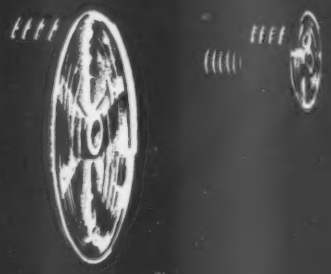
Condor V-Belts–More use per dollar

Condor V-Belts *e per dollar*

Condor V *ollar*

Con. *r dollar*

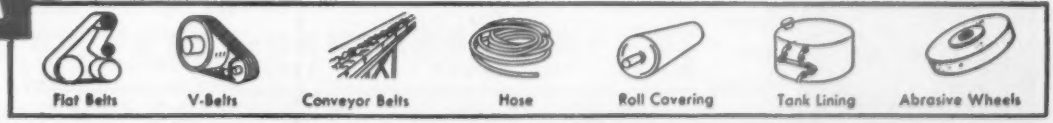
Condor V-Be. *per dollar*



SMOOTHEST RUNNING V-BELTS MADE . . . The result—long life and low V-belt drive costs. Correct engineering makes the difference. Sidewalls are *straight* for more grip, less slip, longer life. The pulling section is micro-positioned. Every Condor V-Belt is correctly balanced and destretched during manufacture. This, too, means longer life. Also in special oil-, heat- static-resisting types . . . Get the engineering facts. Ask the R/M Distributor for Bulletin 6868 . . . He'll show how you also can get MORE USE PER DOLLAR with R/M hose, transmission and conveyor belts.

MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.



Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Brake Linings • Brake Blocks • Clutch Facings
Asbestos Textiles • Teflon Products • Packings • Sintered Metal Parts • Bowling Balls

MR 902

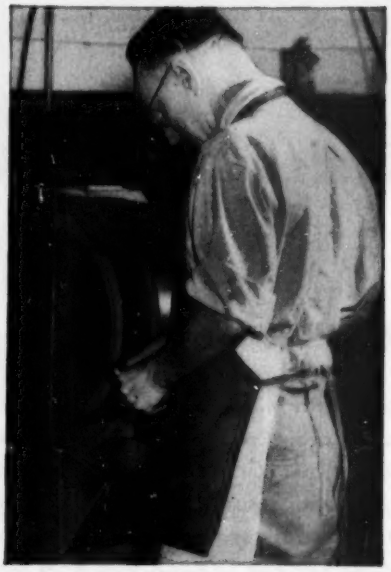
Backstand Belts cut finishing time 70%

5 minutes on a set-up wheel cut to 1½ minutes with Armour Backstand Belts

Changing from set-up wheels to backstand belts saved 3 minutes 39 seconds in finishing forged paving breaker handles, reports a well-known company*. This operation formerly took 5 minutes 11 seconds. And this wasn't the only saving. Backstand belts outlast 4 to 5 set-up wheels; without dressing they remain flat and true. And due to their uniform grit, they give a better finish.

Belts are only one of the many forms of Armour coated abrasives. There are more than 30,000 different varieties in grit size, backing, etc. We have sheets, disc, rolls, tubes—and specialties to meet your specifications. Your industrial supply distributor will tell you about the Armour line. Call him today!

The complete story of the money-saving backstand belt method is covered in our free booklet offered below. Send the coupon for your copy now!



*Name of company available on request

We recommend buying through your industrial distributor

MAIL THIS COUPON TODAY!

Armour and Company · North Benton Road · Alliance, O.
Please send me your free booklet, "Backstand Belt Polishing."

Name ..... *Title* .....
Firm .....
Address .....
City ..... *Zone* ..... *State* .....

F

PRODUCTION CONTROL...

Begins on page 296

year, one has been promoted to dispatch foreman; one to stockroom foreman; one to assistant stockroom foreman (he was a shop man who had been an expediter).

One trainee is now shipping foreman; one receiving foreman; one trainee is in charge of the warehouse; one is in charge of raw materials handling; and one, with a specific interest in time study, was sent to the time study department.

The other four, the last to come into training, are still on their jobs in production control.

If a trainee works into the foremanship job well after a minimum of a year or so, we feel his initial training and knowledge of company procedure is complete.

Where Do They Go From There?

The main promotional flow from this point is into industrial engineering, sales, or procurment—according to the interests and abilities of the trainees, and the company's needs.

A good percentage of the men who go to industrial engineering move later into production, quality control, and cost control jobs, since we consider industrial engineering excellent training for these departments.

A few trainees are promoted directly into quality control, cost control, and production. They are usually men with the necessary formal engineering background.

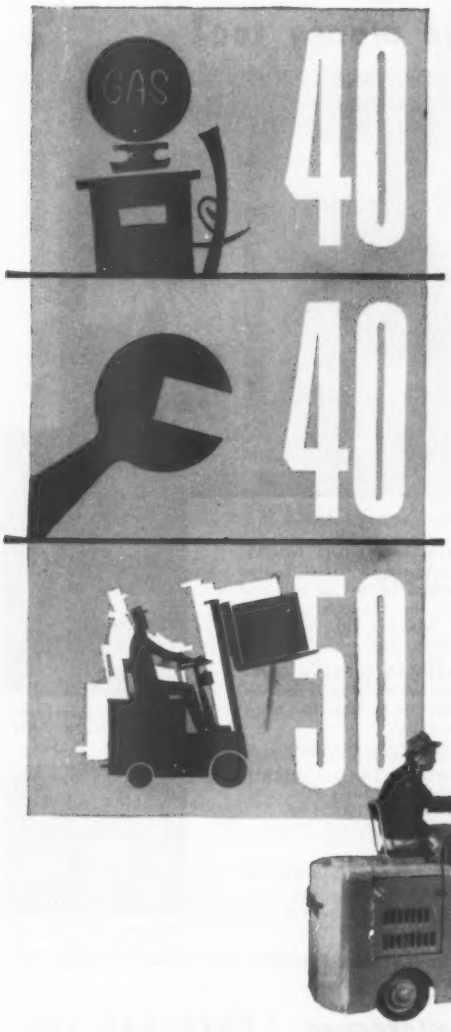
What's the Effect on Production Control?

The resulting high turnover in production control is not harmful. Because the functions of the department are procedurized, training is not too difficult or lengthy. People of the caliber of our trainees take hold quickly enough to minimize inefficiency in the department—and the over-all benefits to the company clearly outweigh this disadvantage.

DO YOU KNOW THE BAKER

gas-O-matic
TRADE MARK

40·40·50 Story?



Independent testing laboratories and large industrial users have proven that the Baker Gas-O-Matic is the *most economical* gas-powered fork truck to own and operate.

40% LESS FUEL

Baker Gas-O-Matic averages about ½ gal. of gas per hour of operation — less than 60% as much as ordinary gas trucks. Here are some of the reasons

- **High efficiency of gas-power, electric drive system**
- **Gas engine always operates at efficient RPM**
- **Efficiency of Baker-built industrial truck drive motor**
- **Efficiency of Baker worm drive power axle.**

40% LOWER MAINTENANCE

Baker Gas-O-Matic has no clutch or gear shift — most common offenders in gas-truck breakdowns. Special Gas-O-Matic variable voltage generator requires no electric controller — no resistance banks. Gas engine runs at lower speeds, reducing engine maintenance. Many other features contribute to lower repair costs and less time out of service.

50% LONGER LIFE

Baker Gas-O-Matic uses standard electric truck parts in all but gas engine and generator — with proven record of 20-year life span. Government permits tax write off of electric trucks over twice as many years as for gas trucks. With one engine replacement Gas-O-Matic trucks should last 10 years or more.

Get the complete story from your Baker representative, or write for Bulletin 1344

THE BAKER-RAULANG COMPANY
1218 WEST 80th STREET • CLEVELAND 2, OHIO

The Baker-Lull Corporation, Subsidiary, Minneapolis, Minnesota
Material Handling and Construction Equipment

Baker
industrial trucks

THAT SETTLES IT- WE INSTALL

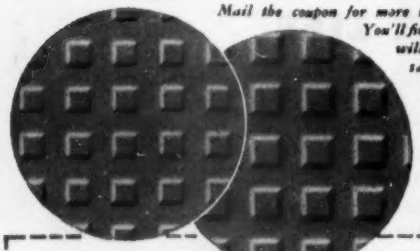
FLOOR PLATES

The safety of your employees and the public is good enough reason to install walking surfaces of slip-resistant J&L Jal-Tread floor plate.

But here are some other important advantages you'll get when you specify Jal-Tread, the only true checker-board floor plate.

- Reduced worker fatigue from feet rocking on uneven surfaces.
- No wheel shimmy in hand industrial trucks.
- Neat appearance . . . easy draining and sweeping in any direction.
- Easy fabrication—square design allows cutting without shearing through raised cleats . . . welding joint of uniform thickness.
- Easy cold-forming on standard equipment.

Mail the coupon for more information today. You'll find J&L Jal-Tread will pay off in greater safety . . . lower maintenance costs.



J&L STEEL

Jones & Laughlin Steel Corporation
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☐ Please send me your free booklet on J&L Jal-Tread.
☐ Please have your representative call.

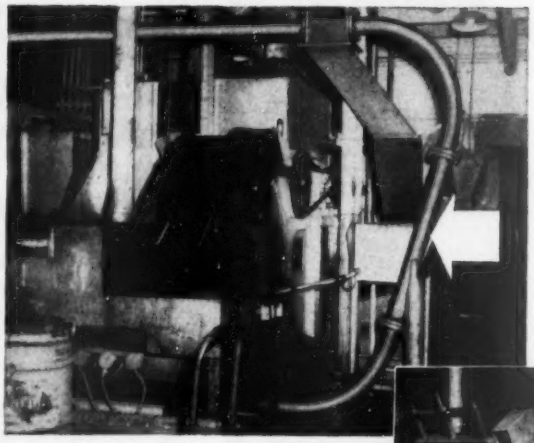
Name_____

Company_____

Address_____

SEE HOW YOU CAN HANDLE "HOT JOBS" WITH Hapman TUBULAR CONVEYORS

and save money too!



Chip-handling conveyor will remove chips from coolant.

THREE MAN-DAYS AND EIGHT HOURS of valuable production time every month were formerly lost in removing scale from the quench tank at Bower Roller Bearing Co., Detroit. An unpleasant job, too!

NOW . . . A HAPMAN TUBULAR CONVEYOR removes the scale *as it collects* . . . takes *no* labor or production time . . . gives *big savings!*

HAPMAN'S UNIQUE, *patented* "Sealed-Pin Chain" construction is highly resistant to abrasive and corrosive action . . . gives greater chain life . . . cuts operating costs. Solid, *tubular* design is liquid-tight.

LET HAPMAN TUBULAR CONVEYORS handle *your* "hot jobs" . . . save *you* money . . . boost *your* efficiency. Get all the details.

Cross section showing Sealed-Pin Chain and Neoprene Flights.

WRITE TODAY FOR BULLETIN FM-1053

Hapman CONVEYORS, INC.
DIVISION HAPMAN-DUTTON COMPANY
KALAMAZOO MICHIGAN

BUS DUCT IS FLEXIBLE

3 men install 755 ft. of BUS DUCT in 4 days at Lapointe Machine Tool Company

Secondary power distribution for a plant expansion was no problem for Lapointe Machine Tool Company, Hudson, Mass.

Westinghouse Plug-in Bus Duct was selected—and installed in record time! Three men using a fork truck completed the 755-ft. installation *in just four days.* The savings paid for an additional lighting job.

The flexibility of plug-ins every foot saved production, too. With power taken temporarily from the duct, they moved 139 machine tools with less than five minutes down time per operator.

Prefabricated in any length up to ten feet, Westinghouse Bus Duct installs easily with sliding-type cantilever hangers. Duct is fully salvageable—can be expanded or relocated readily.

Up to 5000 amperes, Westinghouse Bus Duct has greater current-carrying capacity than any system of wireway, cable or conduit. Four types are available to handle all load conditions and service requirements.

Call your Westinghouse Representative for complete details or write for B-5835, Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Penna.

J-30128

APPARATUS DISTRIBUTION WESTINGHOUSE

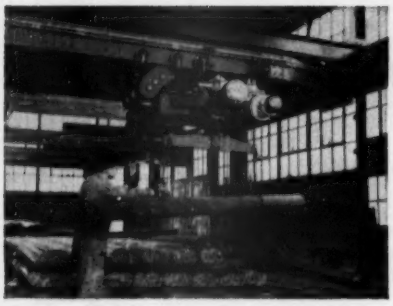
YOU CAN BE SURE...IF IT'S Westinghouse

DESIGN TESTED AND VERIFIED in the Westinghouse HIGH POWER LABORATORY

MONORAIL *Pays!*

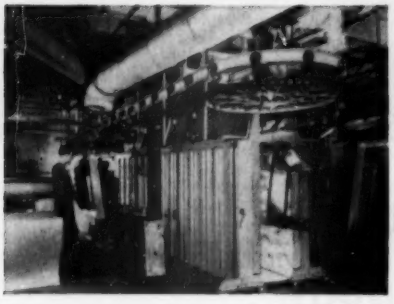
INCREASES TONNAGE

From 26 to 48 tons of steel rod per day was the increased movement produced by a properly engineered monorail system.



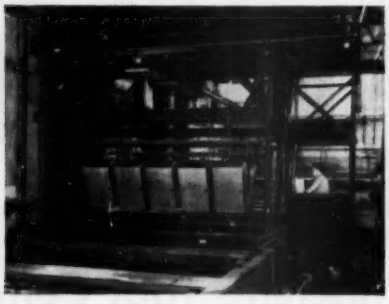
LOWERS COST

This simple system actually saved $150 in handling costs within four months of operation. No more sheet-by-sheet movement.



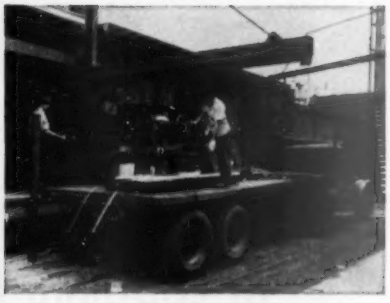
SAVES TIME

Passage, on monorail, of metal parts through infra-red dryer, cuts 70% from former drying time. All other handling in plant on monorail.



MORE CAPACITY

30% more capacity was added to metal cleaning process by handling a third more units on carrier with one man operation from cab control.



LESS LABOR

Operators claim to save 26 man hours per truck over former unloading time. Interlocking monorail cranes in the plant also reduce handling costs.

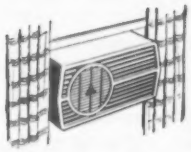
Write for Bulletin C-1
showing many more cases where MONORAIL PAYS!

THE AMERICAN MONORAIL COMPANY

13114 ATHENS AVENUE **CLEVELAND 7, OHIO**

FASTEST THING IN FASTENINGS®

SPEED NUTS® give new Room Air Conditioner "Cool" 82% Assembly Savings!

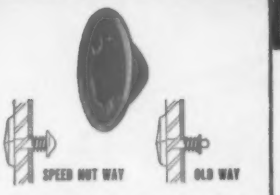


Fedders-Quigan Corporation, Buffalo, plans Tinnerman SPEED NUT savings in design stages

● The results of this fastening engineering greatly reduced assembly costs—brought substantial production increases! Fedders engineers are now using 35 Tinnerman SPEED NUT brand fasteners per unit . . . an increase of 200 percent in the new models, a tribute to SPEED NUT success! Typical of the savings achieved by Fedders is the 82% reduction in the cost of attaching the Comfort Circle grille with a Cap-Type SPEED NUT.

Looking for ways to convert fastening problems into savings? SPEED NUTS will help! These high quality, spring steel fasteners are light weight, vibration-proof and self-retaining; eliminate welding, staking, riveting; can be used over welded studs; do away with threaded inserts. These are a few of the SPEED NUT advantages that will annually save thousands of production dollars for Fedders-Quigan!

See your Tinnerman representative for full information on our free, cost-saving Fastening Analysis service.



Cap-Type Push-On SPEED NUTS

Formerly a special clevis pin and lock washer were required to retain the spring coil and Comfort Circle grille as illustrated above. Now, Cap-Type Push-On SPEED NUTS press on by hand in *one* operation, lock with vibration-proof bite . . . for a big 82% savings!

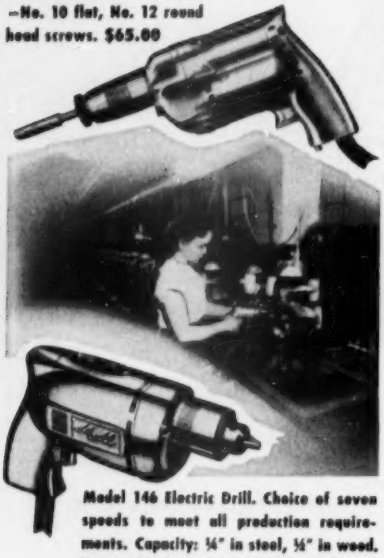
Send for your copy of SPEED NUT "Savings Stories", an interesting booklet of Tinnerman savings to industry, write: TINNERMAN PRODUCTS, INC., Box 6688, Dept. 12, Cleveland 1, Ohio. *In Canada:* Dominion Fasteners Ltd., Hamilton, Ont. *In Great Britain:* Simmonds Aerocessories, Ltd., Treforest, Wales. *In France:* Aerocessoires Simmonds, S.A.—7 rue Henri Barbusse, Levallois (Seine).

TINNERMAN Speed Nuts®

MORE THAN 8000 SHAPES AND SIZES

lightweight powerful Mall production boosters

Model 1435 Electric Screwdriver. Capacity: ¼" hex bit —No. 10 flat, No. 12 round head screws. $65.00



Model 146 Electric Drill. Choice of seven speeds to meet all production requirements. Capacity: ¼" in steel, ½" in wood. Top quality built throughout. $46.00

Whatever your work requirement, you're sure to find the EXACT MALL TOOLS to BOOST PRODUCTION and DOWN COSTS. The extensive MALL line includes every type and size portable electric tool imaginable to meet all kinds of production and maintenance assignments. The name MALL on any tool you buy is your assurance of lasting dependability and top performance... they're built by experts for experts.

Mail this coupon today.

40 Factory-Owned Service Warehouses, Coast-to-Coast, To Give You Fast, Dependable Service.

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Send me all the facts about MALL
☐ Screwdrivers ☐ Drills

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MU-44

From a practising labor attorney, here's some sound advice on the problem of

Making Discharges Stick

By BENJAMIN WERNE, Attorney, New York

"What's tough about discharging a man? If his work is lousy, or he talks back, or breaks a rule, get rid of him!"

Famous last words if you have a union—and the simplest way to get messed up in arbitration and maybe a back pay bill. Not to mention the possibility of violating the labor law, and being charged with an unfair labor practice.

THERE IS NO MORE DELICATE crate of eggs in the collective bargaining package than the provisions for discharge and discipline. Dead beyond recall are the days when the foreman talked and acted tough, and the employee had no recourse but to curse.

SLEEPERS • Breach of a rule has to be clearcut before a penalty is imposed. An employee at Consolidated Vultee Aircraft was fired for sleeping on the job. The case went to arbitration. The union brought out the fact that the foreman's observation was made at a distance of more than 60 feet from the employee.

On top of this, a history of friction and misunderstanding between the two men was shown. People often see "what they expect to see," the arbitrator said. Reinstatement with full back pay was ordered.

Another "sleeper" was reinstated because he never received a warning about his conduct. The employer had only recently undertaken a campaign to discourage sleeping on the job, so a lesser penalty was proper.

These may seem like extreme examples to you, but they should help to point up the nature of most arbitrators in dealing with discharge cases.

INSUBORDINATION? Here's a case where a foreman could have saved his employer a major headache. He discharged an employee on the spot because he hesitated about taking a work assignment. A pure case of insubordination, the foreman maintained.

Was it? At arbitration, two interesting facts were put on the record. The man had 37 years of seniority, without so much as a warning notice to mar his record! Secondly, he had previously been transferred upon a doctor's advice from the very job to which the foreman had tried to assign him.

Even if the man were being insubordinate, the foreman should have considered his record and his reasons before taking such drastic action. One arbitrator listed five factors to be considered in determining a penalty. Any one or combination of them could mitigate the offense and make the maximum penalty inadvisable:

To keep going longer... replace with

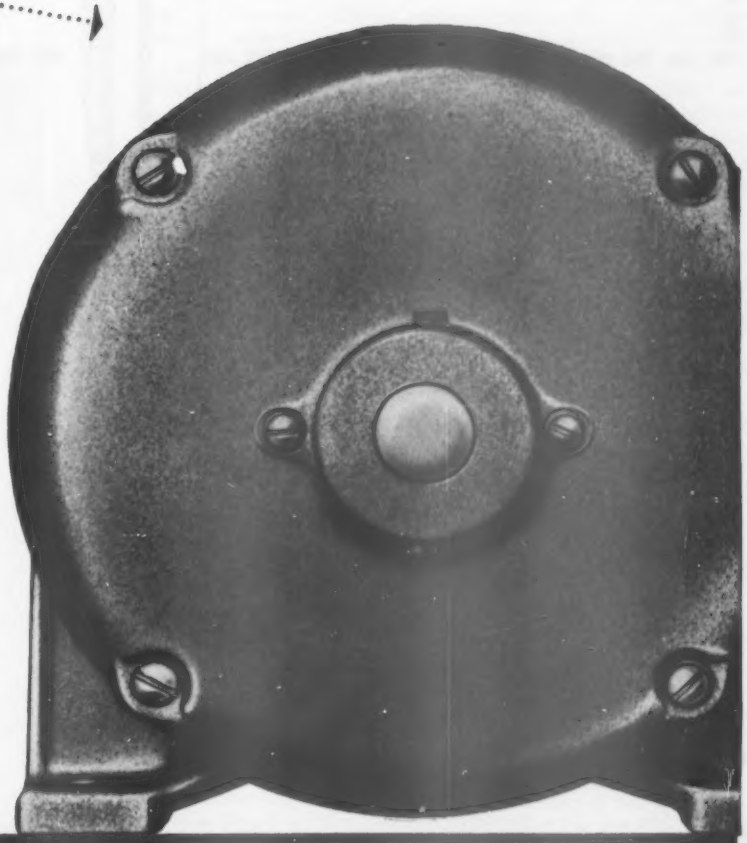
Delco Motors

When conditions are the most severe, Delco motors prove their worth. The high standards that guide their design, engineering and construction insure the extra endurance that minimizes servicing and down-time.

Delco replacement motors are available fast, from your local Delco motor distributor.

THERE'S A DELCO
FOR PRACTICALLY ANY
INDUSTRIAL APPLICATION

Open and enclosed motors up to 100 h.p. for standard foot mountings. NEMA C&D flange-mounted motors up to 30 h.p. Explosion-proof motors up to 20 h.p.



DELCO PRODUCTS

Division of General Motors Corporation, Dayton, Ohio

A GENERAL MOTORS PRODUCT — A UNITED MOTORS LINE

DISTRIBUTED BY WHOLESALERS EVERYWHERE

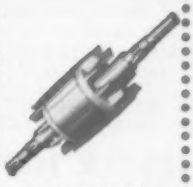
THESE FEATURES KEEP DELCO MOTORS GOING LONGER

Water-Tight Conduit Box. Protects against moisture.

Positive Lubrication. Lengthens bearing life.

Delcote Insulation. Permanently flexible, moisture-proof, wear resistant.

Positioned Bearings. Maintain shaft alignment.



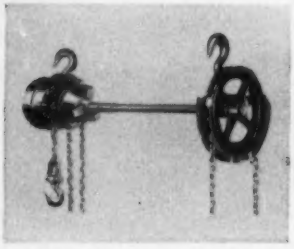
Dynamically Balanced Rotor and Shaft Assembly. Reduces vibration.

Corrosive-Resistant Cast Iron Frame. More solid, more rugged.

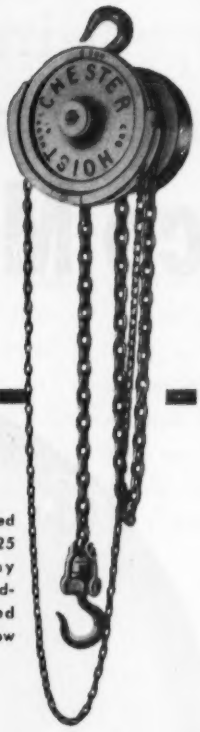
SALES OFFICES: Atlanta • Chicago • Cincinnati • Cleveland • Dallas • Detroit • Hartford • Philadelphia • St. Louis • San Francisco

ASK YOUR DISTRIBUTOR FOR

CHESTER HOISTS



Chester Spur-Geared Chain Hoists, ¼ to 25 ton . . . and many special types including the Extended Handwheel and Low Headroom.



BECAUSE THEY'RE DURABLE

. . . from hook to hook. Chester Hoists are built for a steady job of lifting, and built to last with quality castings and forged parts, and with Timken Tapered Bearings for smoother operation and longer wear.

BECAUSE THEY'RE DEPENDABLE

. . . Chester Hoists are expertly designed and ruggedly constructed to deliver high mechanical efficiency in everyday lifting. They're actually built to a safety factor of 5 times the rated load, to protect your men and equipment.

BECAUSE THEY'RE ECONOMICAL

. . . ease of maintenance is an outstanding feature of Chester Hoists. With Timken instead of ordinary bearings, they can be much more readily torn down and reassembled . . . serviced on the spot in a matter of minutes with ordinary tools.

BECAUSE THEY'RE SPEED-SERVICED

. . . any Chester Hoist part can be quickly supplied as needed. When your hoist requires factory overhaul and testing, it will be done quickly and completely, and the hoist will be rushed right back to work for you.

Ask your distributor, or write us, for complete catalog, and tell us your requirements.

CHESTER HOIST DIVISION

The National Screw & Mfg. Company, Lisbon, Ohio

National Fasteners — FASTENERS — HODELL CHAINS — CHESTER HOISTS

MAKING DISCHARGES STICK

Begins on page 308

Provocation, if any, for the violation;

Nature of the order or rule violated;

Gravity of the consequences of violating the order;

Prior record of the offender;

Seniority of the offender.

LOAFING • Absence of "positive evidence" to support the charges has blocked many attempts to discipline an offender, no matter how just the complaint. In one case, a man was fired for loafing. The company based its action on the word of a supervisor, who claimed to have seen the man standing around on several occasions.

When the case went to arbitration, it turned out that (a) the foreman had not been in the department constantly, but had popped in and out during one afternoon, and (b) the man's job entailed occasional waits for materials.

The company failed to produce any time sheets or records that would show reduced output in black and white. The arbiter concluded that no penalty was justified, since the foreman might have come in just at the times when the man was legitimately waiting for materials.

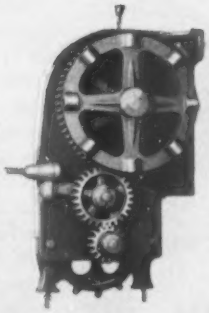
REAL REASON? You can find case after case in the records of the Labor Board where an employee was fired for one cause or another, but was reinstated because the real reason for discipline was found to be retaliation against union activity. For example, you can't have a rule against lateness on the books, ignore it for a couple of years, then suddenly fire two men who were 10 minutes' late without arousing somebody's suspicions. Not only must the penalty fit the crime, but it must be imposed uniformly.

Turn the page

Rolling Steel Doors

Standard or Automatic Underwriters' Labeled Types!

Mahon Release Device and Governor on the Automatic Closing Mechanism of a Mahon Underwriters' Labeled Rolling Steel Fire Door. In case of fire, Fusible Links release the closing mechanism and the door closes automatically.



Mahon Release Device on the Chain-Gear Operator of a Mahon Mechanically Operated, Underwriters' Labeled, Automatic Rolling Steel Fire Door. Fusing of the Fusible Link, which releases the Automatic Closing Mechanism, simultaneously disengages the Chain-Gear Operator.

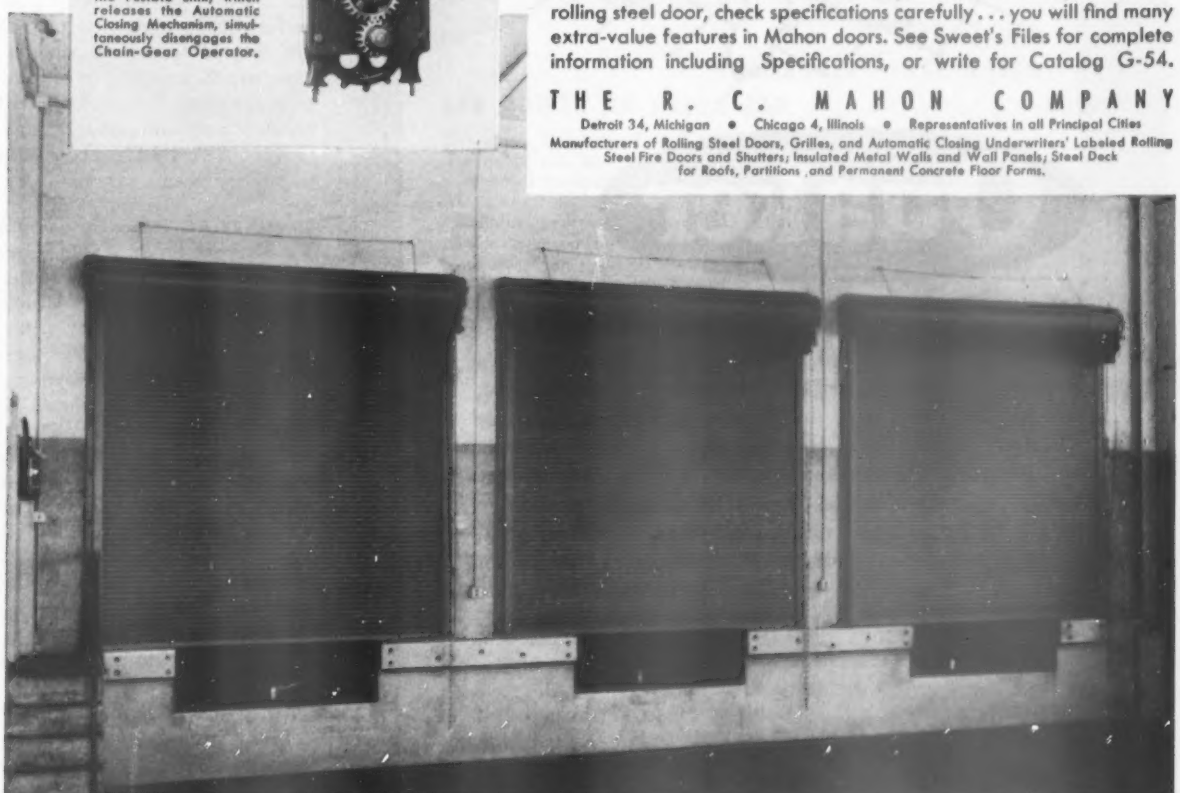
Manually, Mechanically, or Power Operated

Below you see three Mahon Automatic Underwriters' Labeled Rolling Steel Doors installed on fire-wall openings of an enclosed shipping dock. These doors normally remain open, but are equipped with mechanical chain-gear operators which permit closing or opening at will. If a fire should occur while they are in the open position, they automatically close and prevent the spread of fire through the openings. This is one use for one type of rolling steel door. Many types are produced by Mahon to meet virtually any door requirement. Mahon quick-opening, quick-closing power operated rolling steel doors offer more desirable features than any other type of door . . . the vertical roll-up action utilizes no usable space either inside or outside the door opening. There are no overhead tracks or other obstructions to interfere with crane operations. No other type of door offers these advantages of space economy and compactness in operation. In addition, rolling steel doors are permanent—their all-metal construction assures a lifetime of trouble-free service and maximum protection. When you select a rolling steel door, check specifications carefully . . . you will find many extra-value features in Mahon doors. See Sweet's Files for complete information including Specifications, or write for Catalog G-54.

THE R. C. MAHON COMPANY

Detroit 34, Michigan • Chicago 4, Illinois • Representatives in all Principal Cities

Manufacturers of Rolling Steel Doors, Grilles, and Automatic Closing Underwriters' Labeled Rolling Steel Fire Doors and Shutters; Insulated Metal Walls and Wall Panels; Steel Deck for Roofs, Partitions, and Permanent Concrete Floor Forms.



ROLLING STEEL DOORS, SHUTTERS AND GRILLES TO MEET EVERY REQUIREMENT

Three Mahon Underwriters' Labeled, Automatic Rolling Steel Fire Doors installed on openings to an enclosed truck loading dock in a new plant for Towne-Robinson Nut Co., Detroit, Mich. Austin Engineers, Inc., Designers. The Austin Company, Cleveland, Ohio, Gen. Contrs.

MAHON

Takes rough use—
Gives long service

Quaker

WATER HOSE

Stands up under the toughest conditions . . . because it's *built to take it.* Always light in weight, extremely flexible, non-kinking, and easy to handle, Quaker water hose withstands weathering, abrasion, scuffing...even yanking and twisting. Quaker has a water hose for your specific task . . . from Hercules brand for general washdown service to Ironsides brand for high pressure jetting work. Your choice of horizontal braided, moulded braided, or wrapped construction. For long service and complete satisfaction, insist on Quaker for water hose.

Write for name of nearest distributor

Belting, Hose, Packing and Moulded Rubber of every construction for every need.

QUAKER RUBBER CORPORATION
DIVISION OF H. K. PORTER COMPANY, INC.
OF PITTSBURGH
PHILADELPHIA 24, PA.
Branches in Principal Cities

MAKING DISCHARGES STICK

Begins on page 308

CARELESS WORDING of the clause may result in tying management's hands. At one time, a major farm equipment producer's agreement stated that employees could be discharged or laid off for proper cause. An instance arose where the company decided that an offending employee should be demoted.

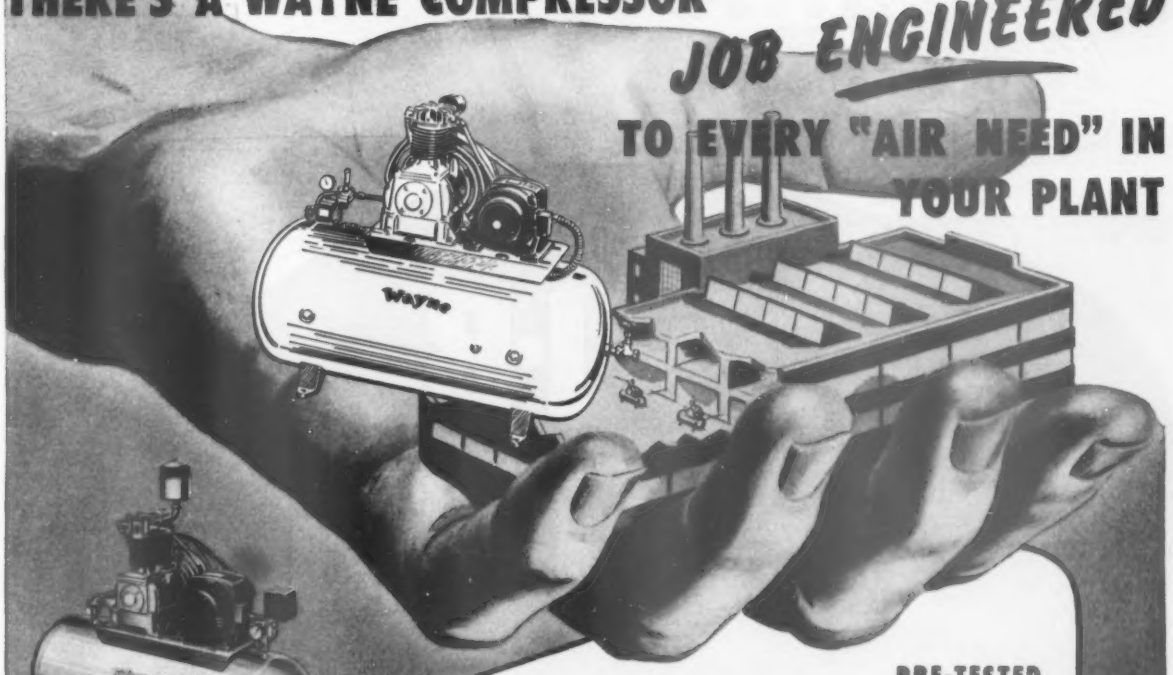
The union insisted that this violated the contract, and was upheld. To express one thing is to exclude others, the arbitrator said in (Latin). The employer was limited to those forms of discipline expressed in the agreement. Thus it is that most carefully drawn clauses state that "the company may impose discipline including, but not limited to, layoff, suspension, or discharge." In similar circumstances, forfeiture of holiday pay and other monetary penalties have been held to be improper.

SUMMARY ACTION · Notice and warning are desirable, but there are instances that do demand summary action. Unless the contract spells out situations where summary discharge is permitted, however, it would be very difficult to make it stick.

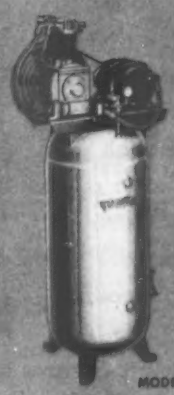
Naturally the offender has the right to press for a review of his case. However, arbitral review should be limited to assessment of the facts involved. There should be no substitution of the arbitrator's judgment for management's as to the extent and nature of the penalty.

One after another, cases could be cited where the arbitrator cut a discharge penalty to suspension or layoff, or reduced a two-week layoff to three days. If the facts are found to be as recited by the employer, there should be no toying with penalty previously imposed.

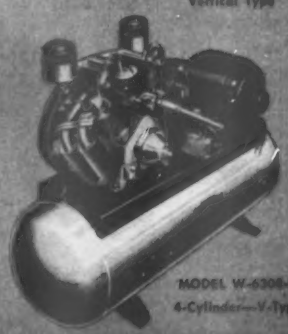
THERE'S A WAYNE COMPRESSOR JOB ENGINEERED TO EVERY "AIR NEED" IN YOUR PLANT



MODEL W-6146-H
Horizontal Type



MODEL W-356-V
Vertical Type



MODEL W-6308-H
4-Cylinder—V-Type

PRE-TESTED
GUARANTEED FULL RATED

AIR POWER ON EVERY JOB

Designed, engineered and built under rigid quality-control in Wayne plants, each compressor is "job-engineered" . . . you are assured of buying guaranteed air output for a specific job. Wayne Air Compressors are checked and pre-tested for volumetric efficiency, performance and operating tolerances. Every working part is designed for minimum maintenance and low operating costs. Next time you need an air compressor get a Wayne . . . get your dollars' worth in air output and in service.

ENGINEERED 10 WAYS BETTER

1. Larger aircooling flywheel
2. Extra cooling fins on cylinder blocks
3. Easily cleaned intercooler
4. Dual intake valves
5. Positive lubrication system
6. Dual moisture extractors
7. Counter-balanced flywheel . . . smoother operation
8. Automotive type pistons . . . less heating
9. Accessible drain-cock assures easy moisture removal from tank
10. Easy to clean filter and muffler

THE WAYNE PUMP COMPANY

Salisbury, Maryland — Toronto, Canada

Wayne

NATION WIDE SERVICE

INDUSTRIAL LIFTS • HOSE REELS • AIR COMPRESSORS

O-B VALVES

You Can See the Value!

Look at the hexes on this O-B gate valve. There's ample room for a full wrench grip. The handwheel is big and easy to grip. Inside the pipe ends you'll see more than enough threads to prevent possible jamming of the seat. There's weight where weight counts -- neck of body, centerpiece, pipe ends. In fact, you find all the best design features in O-B valves. Ask your distributor about them.

Ohio Brass

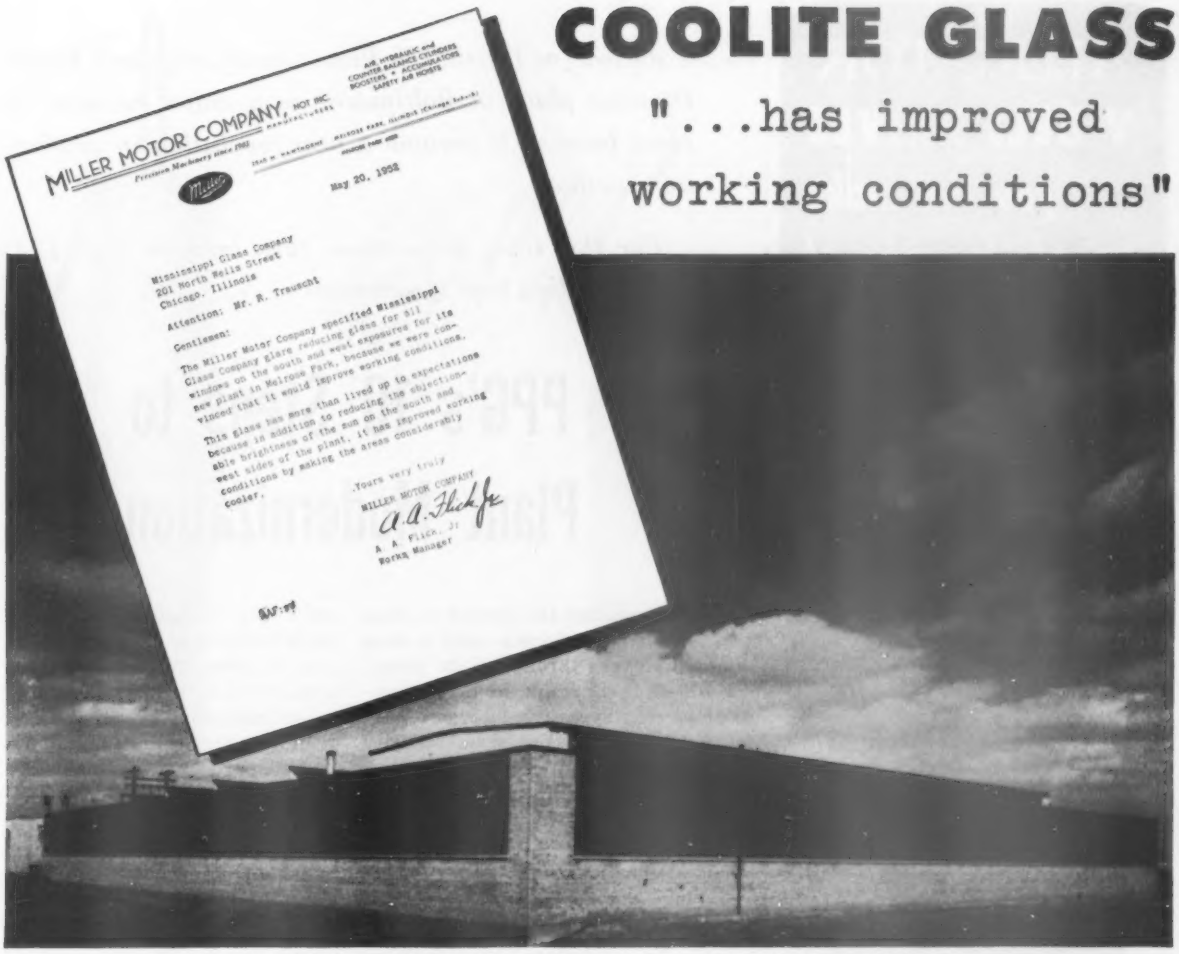
MANSFIELD OHIO, U. S. A.

BRONZE GLOBES, ANGLES, GATES AND CHECKS FOR INDUSTRIAL SERVICE

4374-V

COOLITE GLASS

"...has improved working conditions"


MILLER MOTOR COMPANY, NOT INC.
May 20, 1952
Mississippi Glass Company
201 North Wells Street
Chicago, Illinois
Attention: Mr. R. Trausch
Gentlemen:
The Miller Motor Company specified Mississippi Glass Company glare reducing glass for all windows on the south and west exposures for its new plant in Melrose Park, because we were convinced that it would improve working conditions.
This glass has more than lived up to expectations because in addition to reducing the objectionable brightness of the sun on the south and west sides of the plant, it has improved working conditions by making the areas considerably cooler.
Yours very truly
MILLER MOTOR COMPANY
A. A. Fluck, Jr.
Works Manager

Miller Motor Company, Melrose Park, Illinois. John S. Cromelin, Architect, Hamilton Glass Company, Glazier.

Manufacturer of Air and Hydraulic Equipment Selects COOLITE GLASS by Mississippi to Cut Raw Sun Glare and Heat

Modern management knows that workers who see better, produce better... and this testimonial from a user of Coolite, Heat Absorbing, Glare Reducing Glass by Mississippi highlights the importance of "visioneering" in a modern plant. Coolite traps and absorbs much of the sun's heat—helps keep interiors comfortably cool. Coolite also filters out annoying glare, floods work areas with pleasantly tinted, softened, filtered light that cuts costly eye fatique.

Conditioned, natural illumination helps reduce operating costs—and Coolite is easy to maintain, eliminates need for painting or makeshift blinds.

Specify Mississippi Glass to your architect, builder or contractor. Available in a wide variety of patterns and surface finishes, all scientifically designed to distribute light to best advantage.

MISSISSIPPI Glass COMPANY

88 ANGELICA ST. SAINT LOUIS 7, MO.

NEW YORK • CHICAGO • FULLERTON, CALIF.

SEE HOW COOLITE CAN SAVE MONEY FOR YOU

If your are modernizing existing facilities or constructing new ones, include Coolite Glass in your plans. Its cool, blue-green color adds a modern note to any exterior. Coolite's filtered light can provide increased efficiency ond economy, boost employee morale and reduce rejects. See your Mississippi Glass distributor today.

Send for free Coolite Catalog, "Coolite Heat Absorbing and Glare Reducing Glass." Samples on request.

WORLD'S LARGEST MANUFACTURER OF ROLLED FIGURED AND WIRED GLASS

ALLIGATOR
V-BELT DRIVES
. . . you can make up all lengths of V-Belts quickly

★ **Units contain V-Belting, Fasteners and Tools** — everything you need in one package for all emergencies when correct endless V-belt is not available.

★ **Avoid costly delays,** shut-downs and pickups.

★ **Eliminates costly dismantling** of machinery when re-belting.

★ **Completely modern make-up units** that give you peace of mind as well as stock on hand.

★ **Less Stretch and Follow-Up Maintenance.** Just One Strong Joint.

★ **Alligator V-Belt Drive Units,** available in sizes A, B, C and D. B size furnished in display box.

★ **Order from your distributor. Ask for Bulletin V-215.**

FLEXIBLE STEEL LACING CO.

4678 Lexington St. Chicago 44, Ill.

It started (at Pittsburgh Plate Glass Company's Brush Division plant in Baltimore) as a major revision of plant layout. It became a near-revolution in production methods.

For this story in pictures, turn back to page 134. Begin reading here if you want . . .

PPG's 10 Steps to Plant Modernization

1. Explained the project to plant management group—and to shop employees through their union. Told them result would be fewer employees for the same production, but employees' security would be strengthened—and, unless the company did maintain its competitive position, the future might see layoffs anyway.

Scheduled and special meetings kept the employees informed of progress.

To stimulate participation, foremen and union officers received training in time study and methods analysis.

2. Drew the existing picture of operations, including scale layouts and flow diagrams of processing, services, and storage.

3. Analyzed operations and products to see what operations could be combined, what products could be grouped into production lines.

The traditional pattern was small-lot production — moving totepans of brushes from one operation to another. In this step the objective was to condense production operations into lines, or into smaller and more compact groups.

4. Looked for ways to improve individual methods. Special attention went to operations that required a lot of time and labor.

Some results of this effort were (1) a machine to make large volumes of small, inexpensive brushes automatcially, (2) a machine to perform finishing operations — beat, comb, and trim; (3) standardization of purchased parts and containers.

5. Drew new flow charts that incorporated selected changes in methods and layout. This engineering step provided a starting point for the next step.

6. Analyzed proposed flow charts step by step, utilizing the experienced ideas and judgment of plant people. Analysis included experimenting with pilot models of unproven ideas. Estimated comparative costs and savings were required.

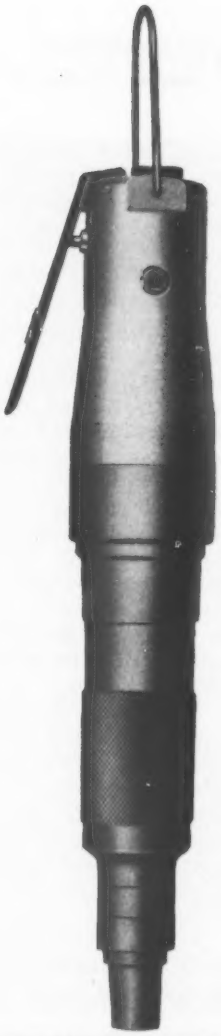
Seven revisions later the charts were frozen.

7. Reorganized and retrained supervision. Actually, this step ran concurrently with others. But it had to be completed at this stage.

Former supervisory organization was by processes. Combining processes required foremen to know more about manufacturing, and learn new methods.

Also, streamlining operations effected a reduction in the number of foremen.

8. Set up a schedule of changes. Moving equipment had to be planned. But, also affected: production planning and schedul-



Step up YOUR OUTPUT

Size OOBLC Screw Driver quickly drives #10-32 round head screws on a household ironer assembly.

A Size OOAMC Screw Driver makes quick work of driving #10 screws 1½" long to attach the spring mechanism on a rocking chair. The wood involved is alder; not predrilled.

Here a Size OOOBLC Screw Driver is used to assemble clocks. The job consists of driving Reed-Prince screws.

A Size OALC Screw Driver speeds the installation of the hood lock on an Automotive Assembly line.

with Ingersoll-Rand Air Powered Screw Drivers

More production in auto plants! . . . *More production* in an electric clock factory! . . . *More production* on a farm equipment assembly line! . . . *More production* of oil burners, metal products, home appliances, and products of every kind and description.

The credit? Ingersoll-Rand Air Powered Screw Drivers—with features that make it the world's best! The "Cushion" Clutch . . . amazing I-R Multi-Vane Air Motor . . . Torque Limiting Clutch . . . and many other design points enable operators to turn out more jobs with less effort.

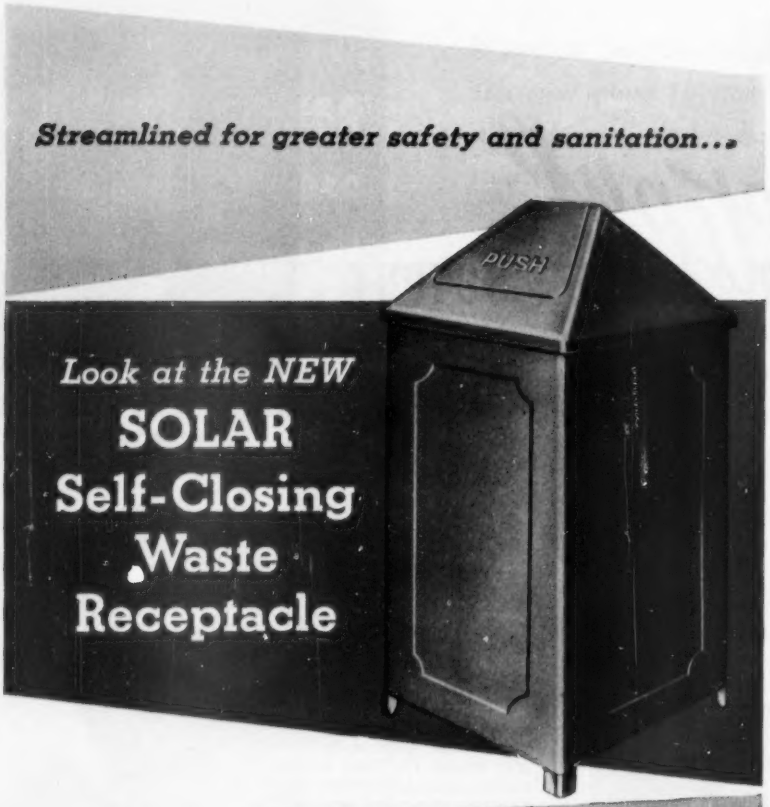
46 sizes of air powered screw drivers are available with attachments to drive any type of threaded fastener.

Reversible and non-reversible models, also angle screw drivers.

TRY 'EM AND SEE! Phone or write your Ingersoll-Rand office today for details. No obligation.

Ingersoll-Rand 11 Broadway, New York 4, N. Y.

920-8



7 SOLAR FEATURES
Safe to Use
Cuts Overhead
Cuts Cleaning Costs
Cuts Plumbing Expense
Reduces Fire Hazard
Quiet in Operation
Withstands Tough Usage

For over a quarter of a century, SOLAR has been recognized for the uniqueness of its design and quality of performance. The new "200" series offers even finer features in design and construction. They combine to produce a product that is streamlined for greater safety and sanitation.

SOLAR-STURGES Mfg. Div.,
PRESSED STEEL CAR COMPANY, INC.
Melrose Park, Illinois

PSC

SEND FOR BULLETIN!

SOLAR-STURGES Mfg. Div.,
Pressed Steel Car Company, Inc.
Melrose Park, Illinois
Dept. FM-10

Gentlemen:
Please send me additional literature on Solar's line of Self-Closing Waste Receptacles.

Name.....
Firm Name.....
Address.....
City.....Zone.....State.....

Begins on page 316

ing; inventory control; supervision; job evaluations; wage incentives; training. All had to be integrated.

From start of the project to first move took about eight months. Rearrangement, without loss of production, required about six months.

9. Balanced new production lines, adjusted new layouts and methods. As each unit was set up engineers and supervisors worked with it to smooth the wrinkles, and train operators in the new methods. Nearly 50 per cent of the employees had 10 or more years of service, so training wasn't easy.

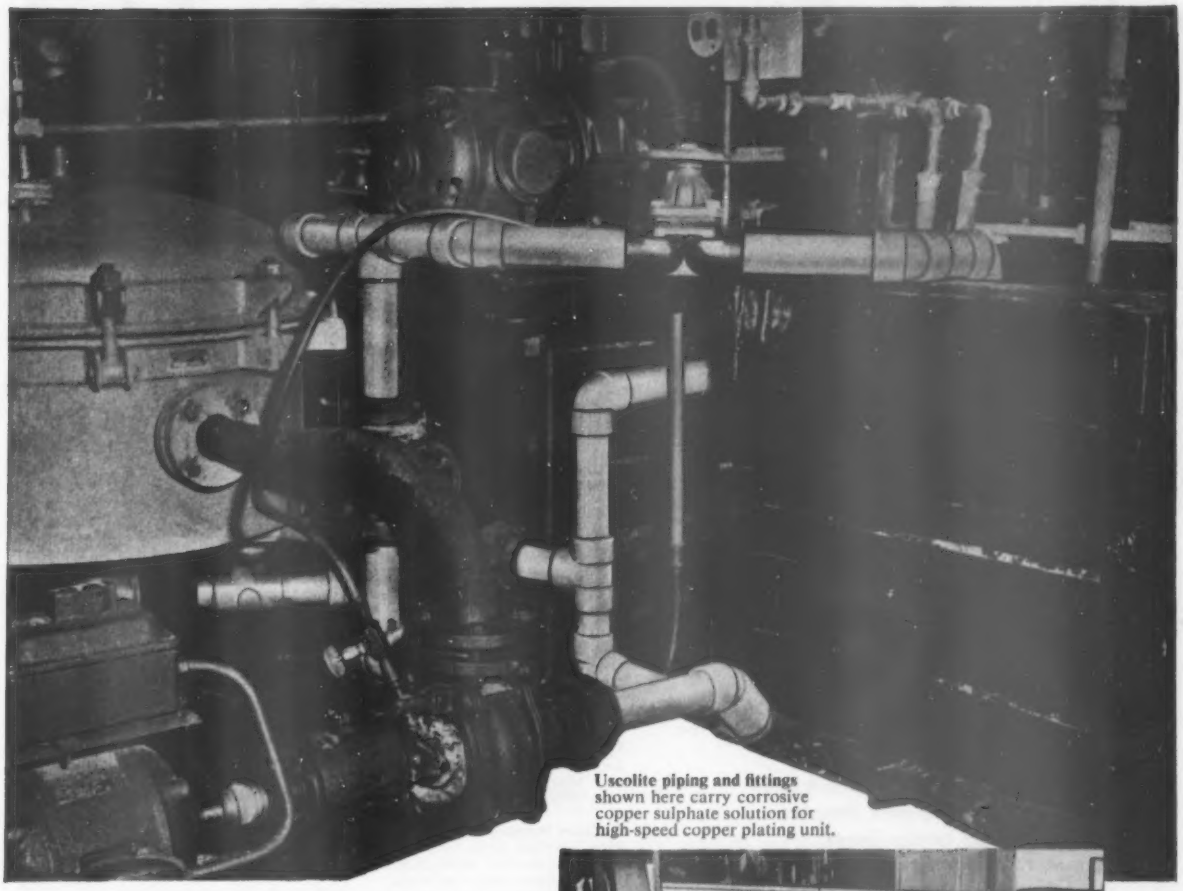
10. Revised wage rates and incentive plans. New methods changed jobs, requiring re-evaluation. Naturally, the old incentives were obsolete. New incentives were developed as soon as possible after operators became accustomed to their work. During the interim period average earnings were paid. This step is still in progress.

SPECIAL PROBLEMS OF MODERNIZATION

There were some knotty problems. Divisional Manager G. E. Hartwell lists the more serious:

- Troubles you can't see until they're uncovered. For instance, wreckers found piping under the old buildings that wasn't on any drawing. Some had to be replaced.
- Maintaining good human relations—with *all* employees. The basic problem is communication—to keep everyone informed on the progress of the project, and to get their thoughts.
- Selecting and scheduling the order of changes—to satisfy employees, customers, and costs.
- Keeping the project rolling, and within the budget. Some good ideas, involving time- and money-consuming development, must be deferred.

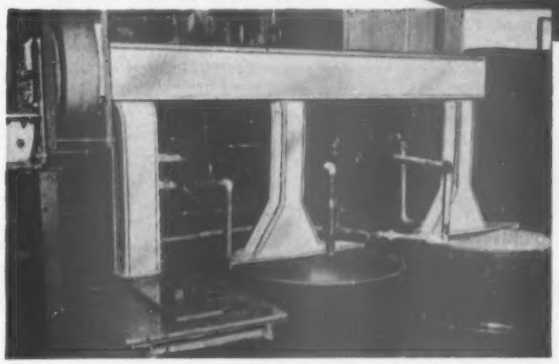
Hungry acids can't eat U. S. Uscolite® pipe



Uscolite piping and fittings shown here carry corrosive copper sulphate solution for high-speed copper plating unit.

A LARGE phonograph record factory needed a piping system which would stand up under the corrosive effects of acids. United States Rubber Company engineers were called in for consultation. They recommended piping, ducts and fittings made of Uscolite, the great "U.S." plastic . . . and the acids gave no more trouble.

Uscolite is resistant to *most* chemicals, acids and alkalies. It has amazingly high impact strength, is easy to handle, can be cut to length and threaded on the job. If you have any difficulties with piping, you can't afford to overlook Uscolite. Call any of our 25 District Sales offices (each is staffed with engineers) or write to address below.



This Uscolite duct, used in the de-chrome room, carries away fumes from a 50% hydrochloric solution at 160 degrees F. The factory also uses U.S. Steam Hose and U.S. Transmission Belts.

U.S. RUBBER
SERVING THROUGH SCIENCE

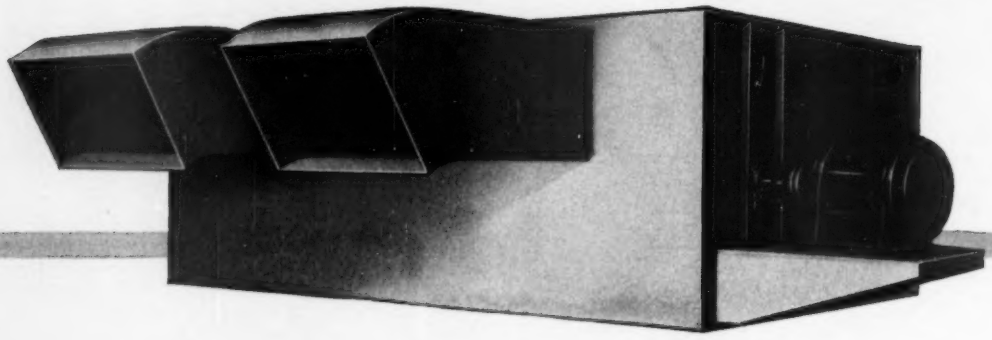
"U.S." Research perfects it
"U.S." Production builds it
U.S. Industry depends on it

UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION · ROCKEFELLER CENTER, NEW YORK 20, N. Y.

Hose • Belting • Expansion Joints • Rubber-to-metal Products • Oil Field Specialties • Plastic Pipe and Fittings • Molded and Extruded Rubber and Plastic Products • Protective Linings and Coatings • Grinding Wheels • Packings • Tapes • Conductive Rubber • Adhesives • Roll Coverings • Mats and Matting

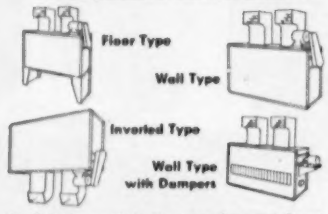
Here's why Trane Torridors can be tailored to fit so many heating jobs!



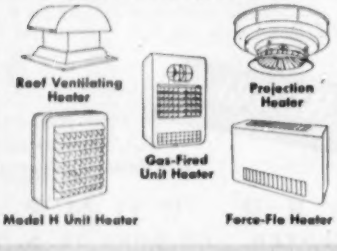
These *standard* TRANE accessories can be combined with any *standard* TRANE Torridor to solve any heating, ventilating, air filtering or process problem.

- **Many coil types . . .**
  High or low pressure steam—Hot water —Standard or "non-freeze" SD type
- **20 Nozzle arrangements**
- **Wide choice of filters and frames**
- **Two types of by-pass dampers**
- **Mixing and intake boxes**

4 More Standard Torridor Models



And 5 Trane Unit Heaters for spot heat where and when you need it.



Now you can have Engineered Heating to solve problems like these with a standard TRANE Torridor!

1. Drafty doorways. Use basic Torridor heating section with nozzles and door switch. Positive blanket of heat every time door opens.

2. Negative pressure. Use Torridor with SD "non-freeze" coils and filter section to introduce fresh tempered air. Maintain positive pressure. Eliminate cold air leaks.

3. Close temperature control. Use Torridor with face-and-by-pass and/or modulated steam distributing coils. Tempers chilly morning air . . . permits mild midday air to enter without overheating.

4. Explosive atmosphere. Use Torridors with spark-resistant fans and explosion-proof motors. Many other variations available.

5. Need for quick warm-up. Use mixing box on Torridor. Fresh air dampers close for quick warm-up—modulate to mix ventilation air with room air.

6. Process heating or drying. Torridor has ample room for three rows of high output coils for process heating or drying applications.

7. Compact central system. The powerful centrifugal fans of the Torridor can deliver large quantities of air through duct systems.

8. Ventilation. Use Torridors for ventilation all year. In the summer, Torridors circulate outside air. In the winter, tempered air.

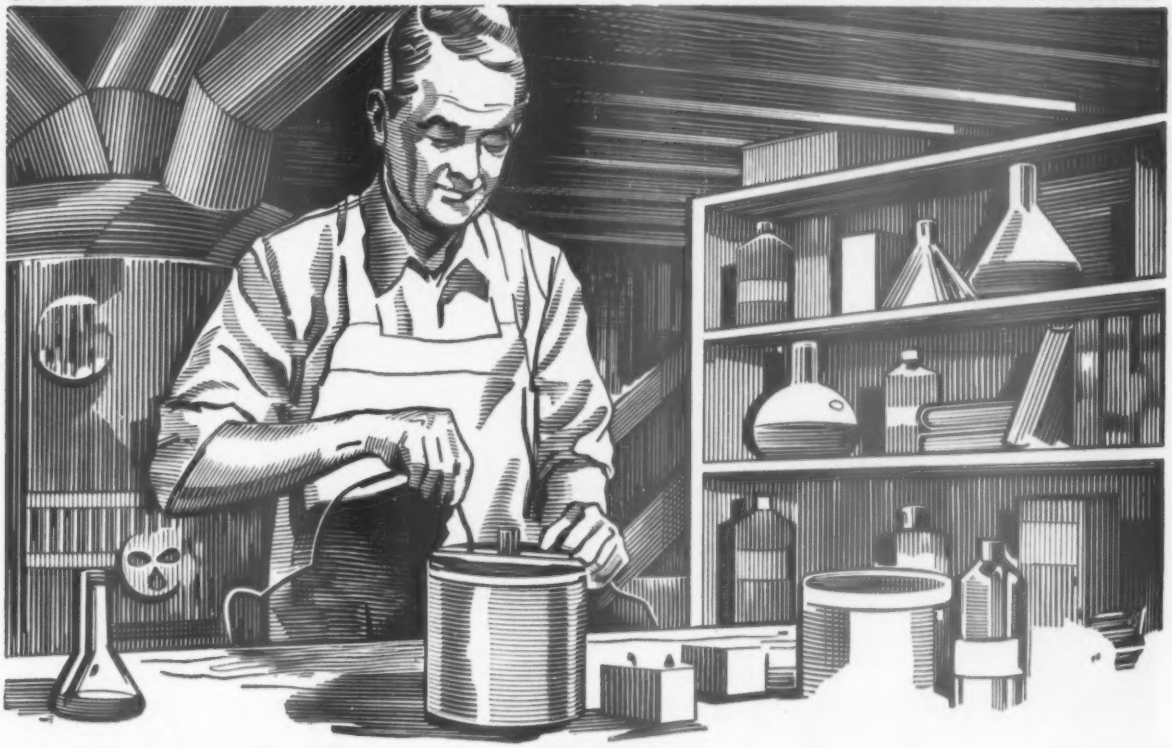
Problems of fog removal, ice melting, drying, curing and many others can be solved with TRANE Torridors . . . automatically, with standard pneumatic or electrical controls. See your consulting engineer or TRANE office. Write TRANE, La Crosse, Wis., for Bulletin DS-327A.

TRANE Torridors

The Trane Company, La Crosse, Wisconsin • East. Mfg. Div., Scranton, Pennsylvania
Trane Company of Canada, Ltd., Toronto • 80 U.S. and 14 Canadian Offices

TRANE—MANUFACTURING ENGINEERS OF HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT.

ONE OF A SERIES OF ADVERTISEMENTS ON THE HISTORY OF ELECTROPLATING



marvin udy's cadmium . . .

changed ***your*** way of life!

The modern Udylite Laboratory at Detroit, Michigan

A set of rusty piano wires is responsible for the fast, economical modern Cadmium Process you use today.

In 1919, young Marvin Udy became intrigued by a problem that had never been solved—how to rustproof piano wire without changing the tone. He knew that lead, copper and nickel had been tried without success.

After many experiments, Udy tried a little-known waste metal called Cadmium which he had recovered from flues of a western smelting company. After many failures, he finally succeeded in coating piano wire with the then unknown metal!

His new Cadmium Process worked . . . and an industry was born.

The infant Udylite Company, starting in a stockholder's basement, improved methods and techniques in applying the Cadmium. Through the years, the Udylite Corporation has continued to pioneer Cadmium. It developed the Ball Anode, Ball Anode Containers, the Brighteners . . . and has led every step of the way to the better rust prevention offered today in the newest Udylite Bry-Cad Process.

Udylite has shared these technical improvements with you and the entire industry . . . just as it has shared every improvement in Plating Equipment and Processes through the years.

This Udylite Cadmium Process is just *one* of *many* ways Udylite has pioneered in the electroplating field.

PIONEER OF A BETTER WAY IN PLATING...

THE Udylite CORPORATION
DETROIT 11, MICHIGAN

KLEINS

Save Time
On Production

Klein Pliers are favorites on fast-moving assembly lines. They fit the hand perfectly—prevent tiring. The keen knives shear through tough wire easily and stay sharp even after long service. Discover for yourself how these better tools will aid in your production.

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ASK YOUR SUPPLIER

Foreign Distributor: International Standard Electric Corp., New York

"SINCE 1857"

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Established 1857 — Chicago, Ill., U.S.A.
3200 BELMONT AVE. CHICAGO 18, ILL.

NEW MATERIALS

IMPACT STRENGTH AND TOUGHNESS OF MOLDED PLASTIC PRODUCTS will be improved by two synthetic resins developed by The Goodyear Tire & Rubber Co., Akron 16, Ohio. Called Plio-Tuf, the resins are white free-flowing powders that can be fabricated into sheets, rods, and tubes by calendering or extruding.

A COLD-APPLIED ADHESIVE FOR BONDING WOOD BLOCK FLOORS to replace hot pitch has been announced by Smith-Bercall Co., 71 Grove St., Paterson 3, N. J. Elimination of hot melting kettles and fumes from hot pitch are important advantages, the maker says. Application rate is 20 to 40 square feet per gallon. Floor can be used immediately after Bos'n No. 73 Cement is applied.

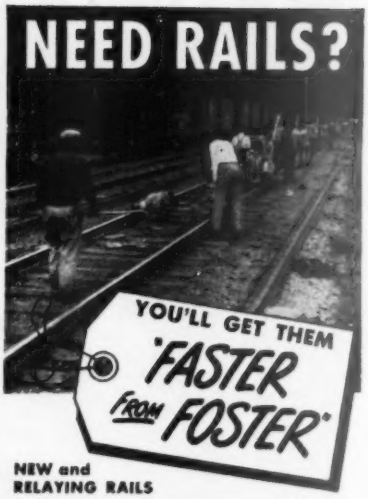
COLORLESS WATER REPELLENT LIQUID for the preservation and protection of exterior masonry has been marketed by the Everseal Manufacturing Co., Inc., 259 W. 57 St., New York 19. Can be applied in a single coat-like paint to brick, concrete, limestone, cinderblock, stucco, cement and asbestos says maker.

LUBRICANT FOR HIGH SPEED MACHINING of stainless, molybdenum, and other high alloy steels is being produced by the Van Straaten Chemical Co., 546 W. Washington Blvd., Chicago. The manufacturer says greater than normal machine speeds and increased tool life can be expected when these oils are used.

FOR IMPREGNATING PRESSURE CASTINGS a plastic sealant called Imprex has been developed by the Tincher Products Co., Sycamore, Ill. The sealant has good penetration properties and shows no evaporation losses and little shrinkage, manufacturer claims.

Turn the page

NEED RAILS?



NEW and RELAYING RAILS
Depend on *FOSTER* to match sizes and specifications to meet all your requirements on any job—new installations or replacements.

***Everything for* INDUSTRIAL TRACK**
Switch Material, Track Accessories and Tools—Prompt shipments from our five nationwide warehouses.

Write for Rails, Switch Material or Track Accessories Catalogs F-10.

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STEEL SHEET PILING • PIPE • WIRE ROPE
Pittsburgh 30, Pa. • New York 7, N.Y.
Chicago 4, Ill. • Houston 2, Tex. • Los Angeles, Calif.

CUSTOM-BUILT—
NOT CUSTOM PRICED

Fully enclosed Ball Bearings; semi-enclosed construction that protects against dripping and splashing hazards and assures cool, continuous operation. Available in polyphase—from ½ to 60 hp, single phase—from ½ to 5 hp, for wide adaptability of use and greater flexibility in your power planning.

Write for Complete Details Today

VALLEY
ELECTRIC CORPORATION
4221 FOREST PARK BLVD. • ST. LOUIS 8, MO.

"We Simplified Ordering, Speeded Servicing When We Specified *Life-Line* Gearmotors"

"We ended round-robin chases to various suppliers whenever speed-reduction equipment is needed. By using Life-Line* Gearmotors we place only one call to one manufacturer...Westinghouse. Our ordering procedure has been greatly simplified, for no other supplier need be contacted to complete our speed-reduction package.

"For servicing, too, we know just where to turn. Every component of Life-Line Gearmotors is made and serviced by Westinghouse. We've learned through experience that *one* call to Westinghouse brings prompt and expert attention for our entire drive equipment. Down time has been reduced which means a real saving for us."

*Trade-Mark

Life-Line Gearmotors Mean Westinghouse Service

Every Life-Line Gearmotor is backed by a nationwide service organization, a ready supply of gearmotor parts, complete repair facilities conveniently located and a staff of field engineers ready for consultation on any of your drive problems.

Your local Westinghouse representative will be glad to give you full details. Call him at any time or write: Westinghouse Electric Corp., P.O. Box 868, Pittsburgh 30, Pa. J-07333

YOU CAN BE SURE... IF IT'S Westinghouse

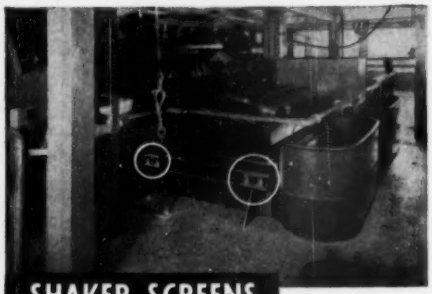
STOP VIBRATION

WITH KORFUND VIBRATION CONTROL AND

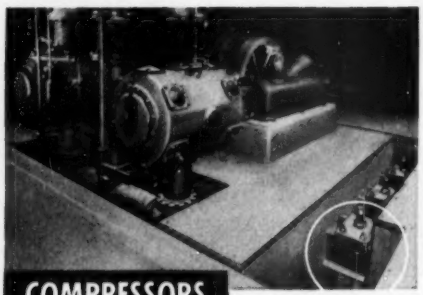
- Install Equipment Anywhere (for better plant layout)
- Reduce Equipment Installation Cost
- Increase Production
- Reduce Maintenance
- Improve Employee Efficiency

Whether your problem is simple or complex, Korfund engineers will gladly recommend the easiest, most economical, *effective* solution. A half-century of experience is at your disposal. There are standard stock Korfund isolators for the majority of installations — special designs when necessary.

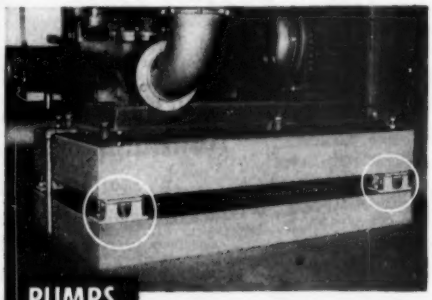
A selector chart is available, giving recommendations for both normal and critical conditions, for pumps, compressors, centrifuges, machine tools, presses, hammers and most other processing and mechanical equipment. Write us for your copy of Bulletin No. 12, or see our catalog in Sweet's Files.



SHAKER SCREENS Korfund Vibro-Isolators installed under these shaker screens, located on a barge, stop vibration transmission into the dock without reducing the efficiency of the shaking action which removes shale cuttings from off-shore oil drilling mud. Another application—low cost upper floor screen installation without reinforcing.



COMPRESSORS Korfund Isolation permitted installation of five 250 H. P. duplex compressors in limited basement space actually overlapping building column footings—yet completely kept vibration from delicate bacteria cultures on upper floors of this pharmaceutical plant.



PUMPS Korfund Vibro-Isolators installed under this large pump and its driving motor completely stop transmission of vibration and objectionable noise to floors below.

For specific recommendations without obligation, contact us or the Korfund representative you'll find in most principal cities.

THE KORFUND CO., INC.

48-35C Thirty Second Place, Long Island City 1, N. Y.
In Canada: 510 Canal Bank, Ville St. Pierre, Montreal

NEW MATERIALS

Begins on page 322

VERSATILE, EASY-TO-APPLY SILICONE-BASED RESIN that can be pigmented in the conventional manner or used in a clear varnish has been developed by the Dow Corning Corp., Midland, Mich. Coatings based on this new material, known as Dow Corning XR-807, can be air dried or baked.

AN ELECTROLYTIC CLEANER for removal of heavy deposits of organic and inert foreign matter from metal surfaces prior to plating has been developed. Called "197" by Klem Chemicals, Inc., 14401 Lanson, Dearborn, Mich. It frees polishing and tumbling compounds that harden and are difficult to remove.

ADWELD has holding power comparable to that of metal welds says the maker, Miracle Adhesives Corp., 214 E. 53 St., New York 22. Applied easily, sets quickly, and produces a bond with 3000-psi. strength to join similar or dissimilar materials or metals without fire hazard. Sets in 10 minutes.

A DIELECTRIC SEALER for use as a flexible potting compound on electrical wiring connections has been announced by the Minnesota Mining and Manufacturing Co., 432 Piquette Ave., Detroit 2. A synthetic rubber material, it retains physical properties from temperatures of –65 to 200 F.

ELECTROLYTIC STRIPPER FOR ZINC BASE DIE CASTINGS has been marketed by Enthone, Inc., 442 Elm St., New Haven, Conn. Nickel and chromium coatings can be readily stripped; copper coatings are a little more difficult, the maker says. Solution operates from room temperature to 180 F.

Turn the page

NEXT TIME...ORDER SCOTTISSUE TOWELS!

1. They drink up water like an Airedale in August.
2. They're strong — even when soaking wet.
3. They're so soft that many people use them as face cloths.
4. They're clean and white — of course.
5. They're double-fold to dry double-quick.

EVER PLAY "GUESS THE WEIGHT"?

ScotTissue Towels have an exceptionally high fiber content. This "bulk," plus generous size and double fold, makes a case of 3,750 ScotTissue Towels weigh 46 lbs.* Some paper towels cost less for 3,750 but are 10 to 20 lbs. lighter*— hence less drying power. Write for more facts. Scott Paper Company, Dept. FM-2, Chester, Pa.

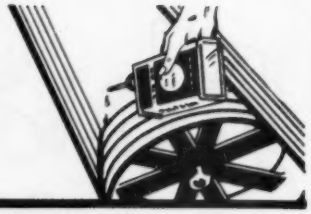
*Shipping weight

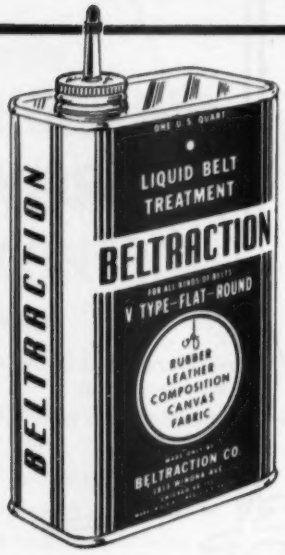
SCOTTISSUE **TOWELS**

Symbol of the right kind of washroom

"ScotTissue," Reg. U. S. Pat. Off.

for Maximum Efficiency





TREAT BELTS WITH Beltraction

Every Time You Lubricate Bearings!

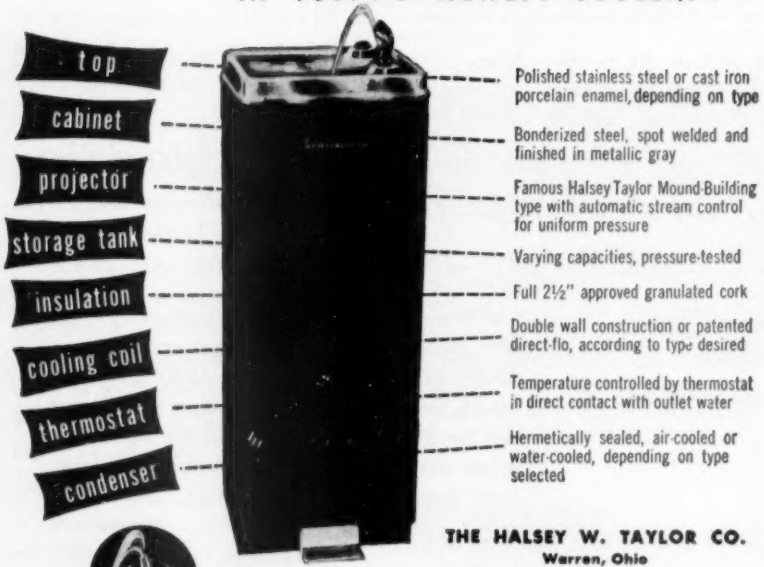
110,000 users of BELTRACTION Liquid Belt Treatment find that it pays to make it a habit to apply this effective conditioner to belts regularly. Because BELTRACTION increases traction 200 to 500%, it prevents costly delays and breakdowns due to belt slippage. Especially recommended for V-belts. Write for interesting folder "Horse Power Where and When You Need It" which gives results of tests of BELTRACTION by United States Testing Company, Illinois Institute of Technology and other prominent laboratories.

BELTRACTION COMPANY
1823 W. Winona St. Chicago 40, Ill.

FOR ALL TYPES OF BELTS • V-TYPE, FLAT OR ROUND

Every feature of tomorrow

IN TODAY'S NEWEST COOLERS!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cabinet
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Polished stainless steel or cast iron porcelain enamel, depending on type
Bonderized steel, spot welded and finished in metallic gray
Famous Halsey Taylor Mound-Building type with automatic stream control for uniform pressure
Varying capacities, pressure-tested
Full 2½" approved granulated cork
Double wall construction or patented direct-flo, according to type desired
Temperature controlled by thermostat in direct contact with outlet water
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THE HALSEY W. TAYLOR CO.
Warren, Ohio

F-28

SEE OUR CATALOG IN SWEET'S

Halsey Taylor

COOLER FOUNTAINS

NEW MATERIALS

Begins on page 322

CONCENTRATED CHROME PLATING SOLUTION. Chromasol No. 2, is prepared for use by adding three parts water to one part solution. Deposit rate is said by the maker to be exceptionally fast. Ward Leonard Electric Co., Mount Vernon, N. Y.

VERSATILE PROTECTION FOR METALLIC AND NON-METALLIC SURFACES is offered by Nerva-Kote Tae coatings. Produced by the Rubber & Plastics Compound Co., Inc., 30 Rockefeller Plaza, New York 20. They are room temperature cured, fast drying, and can be recoated in 6-8 hours.

ELECTRICAL CONTACT MATERIAL laminated in ingot form through heat and pressure, then cold rolled to the required dimensions, is available from the D. E. Makepeace Co., Attleboro, Mass. Called Raised-Lay, it consists of one or more ingots of precious metal bonded to a base metal. Contacts can be blanked or formed around the ingots.

TRANSPARENT COATING FOR POLYSTYRENE that is scratch and flame resistant has been developed by the Schwartz Chemical Co., 326 W. 70 St., New York. Applied by brush, spray, or dip, it drys in air in about 15 minutes and then must be cured in an oven or under infra-red lights. After curing it is immune to certain solvents.

HEAT-STABLE VINYL COMPOUNDS FOR INJECTION MOLDING that are adaptable to dry blending have been announced by Monsanto Chemical Company's Plastics Division, Springfield, Mass. Savings can be accomplished by letting the molders compound ingredients. When drum-tumbled with dry pigment a wide variety of colors can be obtained.

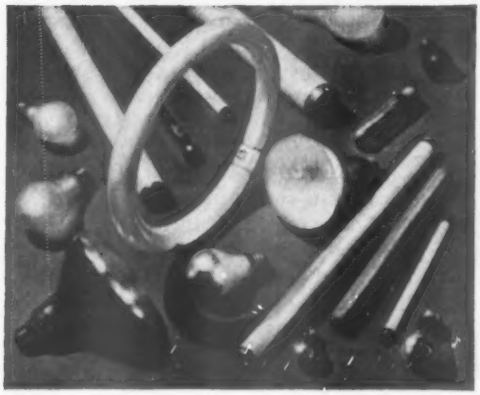
Turn the page

FIXTURES AND WIRING SUPPLIES FOR ANY LIGHTING JOB. Just consider the many different installations shown in this typical plant lighting system.

Yet, from your local Graybar office you can order quickly and conveniently the proper equipment for these or any other lighting applications.

See for yourself — you'll save time and paper work when you *call Graybar first.*

Everything you need for BETTER LIGHTING



10,000 LAMPS. Graybar distributes every type and size of lamp you might require. They're all G-E, so you get the best in quality and long service.

When your employees see better, they work better. And, when you base fixture selection *on individual area needs,* you take the most important step toward efficient, practical plant lighting.

As distributor of the nation's most complete selection of lamps and lighting equipment, Graybar can, therefore, offer you or your electrical contractor comprehensive help in these vital planning and purchasing stages.

By calling a Graybar Lighting Specialist, you can get absolutely impartial advice on the fluorescent, incandescent, or mercury vapor system best-suited to your lighting requirements. You can be sure that the finished installation has been selected with consideration of both initial and operating costs . . . that it has been properly applied . . . and that it provides adequate over-all lighting intensity.

Graybar also distributes more than 100,000 other carefully selected electrical items for wiring, power, ventilation, as well as lighting.

Make it a point to call Graybar for everything electrical — it's the easy way to coordinate both purchasing and deliveries. *Graybar Electric Co., Inc. Executive Offices: Graybar Building, New York 17, N. Y.* 279-1110

Call Graybar first for... Graybar Everything Electrical

IN OVER

for a fabulous finish...

JEWEL BRAND

Abrasive Belts

for grinding, sanding, polishing — metal, wood, leather, plastics, rubber.

ABRASIVE PRODUCTS, INC.
561 Pearl Street
South Braintree 85, Massachusetts

NEW MATERIALS

Begins on page 322

PYROLOCK, A QUICK DRYING MATERIAL, will let treated surfaces withstand temperatures as high as 5000 F. Developed by The B. F. Goodrich Co., Akron, Ohio. Sprayed on like paint, it is nontoxic, non-flammable, non-explosive, and will adhere directly to clean metal surfaces without sandblasting or priming.

INDUSTRIAL SILVER PLATING SOLUTION, NU-SILVER, makes it possible to silver plate without the use of electricity or expensive equipment. A liquid, it can be applied with a soft cloth, brush, or by dipping. Produced by the Specialty Manufacturers and Distributors Co., 508 New York St., Aurora, Ill.

ARROC WATER REPELLENT is a clear silicone-resin material that soaks into masonry and does its work without affecting the outward surface appearance. A product of the Arco Co., 7301 Bessemer Ave., Cleveland 27. Is said to allow vapor to escape, but admits no seepage or moisture penetration.

A RUST INHIBITING OIL ADDITIVE for protection of ferrous surfaces is available from the Atlas Powder Co., Wilmington 99, Del. Known as Atpet 100, it is shipped as a concentrate for addition to the oil. Uses include protection of stored aircraft engines, diesel and gasoline engines, turbines, pipe lines and ferrous tools or components in production.

NO. 994 GRIPTEX is a strong heat-resistant cement for adhering sandpaper to metal or wood sanding discs. Discs can be cemented on top of each other until six or eight have accumulated, then can be removed. Made by Adhesive Products Corp., 1660 Boone Ave, New York 60.

HEAVY STEEL BEAMS are unloaded and stacked, then lifted and carried as needed by the Allis-Chalmers HD-5G Tractor. Maximum stacking height beneath lift fork is 8 ft. 10 in.

MODERN HANDLING with A-C Tractor Shovel Helps Turn Out NEW HOME EVERY HOUR

Up in Port Washington, Wisconsin, the Houses Division of the Harnischfeger Corporation is doing its part to relieve the nation's housing shortage by building a new prefabricated home every hour. The company also is assisting the nation's defense effort by turning out hundreds of barracks for the armed forces — and doing the job fast.

Modern yard-handling methods that employ an Allis-Chalmers HD-5G Tractor and interchangeable front-mounted attachments help make this fast production possible. With lift fork the tractor moves and stacks lumber, lifts steel columns and I-beams, keeps the production line supplied with materials as needed. With shovel and dozer blade it maintains plant roadways, develops parking areas, removes ash from plant furnaces, quickly clears away snow so that there is no interruption in deliveries or yard work. The tractor has proved to be a "real multi-purpose machine," according to the plant manager.

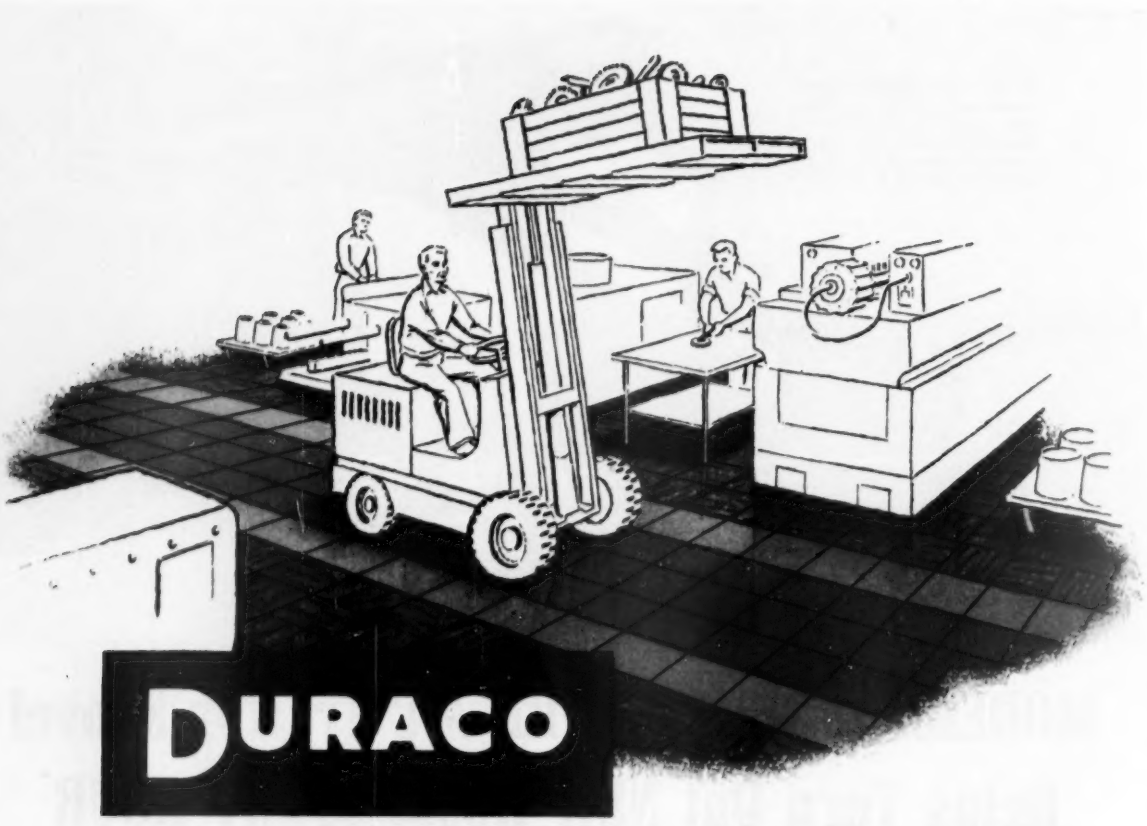
The HD-5G is being used in developing an adjacent six-acre tract, and is also used for various jobs at a second Harnischfeger plant about four miles away. It is easily transported between plants on a low-boy trailer.

See your Allis-Chalmers dealer or write for more information on how materials handling may be speeded up around your plant with the HD-5G — or one of the three larger models with up to 175 net engine hp., 61,600 lb. weight and 4-yd. standard bucket or 7-yd. light materials bucket.

NEW PARKING LOT IS BUILT by the HD-5G. It excavates, levels, handles all kinds of bulk materials, clears away snow with 1-yd. standard bucket or dozer blade.

LUMBER IS CARRIED into factory several tons at a time. With 40 drawbar hp. and 16,200 lb. weight, the HD-5G has both weight and power to handle big loads easily.

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.



THE STAND-OUT INDUSTRIAL FLOOR

that stands up to in-plant trucking and heavy abuse

Duraco is a *durable* floor, designed especially to stand up under the abuse that industrial floors are subjected to.

DURACO STANDS UP to the wear of heavy rolling loads — built-in rugged strength gives it the ability to withstand in-plant trucking.

DURACO STANDS UP to the abuse and penetration of petroleum oils and greases — its tight, smooth surface won't soften and won't absorb dirt, grime and grease.

DURACO STANDS UP to the shock and impact of dropped tools and heavy objects — it's made to take rough, tough abuse day in and day out.

Duraco is made in 12 attractive colors, 3 sizes and 3 thicknesses, making it possible to solve a great variety of industrial floor problems. Since Duraco is unit-installed, it can be laid functionally to outline trucking aisles, storage areas and traffic-ways.

Write us and we will be glad to have a sales representative call on you to discuss your particular flooring problems.

UVALDE ROCK ASPHALT CO.

FROST BANK BUILDING • SAN ANTONIO, TEXAS

Makers of AZROCK • AZPHLEX • VINA-LUX • DURACO

AZROCK FLOORING PRODUCTS

Azrock Floor Products Serve Industry

Work heavy, bulky, hard to move?

Bring the tool to the work...

with Black & Decker Sanders and Grinders!

B&D SANDERS
drive attachments for sanding metal and wood; grinding down welds and casting ridges, cleaning castings, structural steel, tanks, boilers, vats, sheet metal and soldered joints. 7" and 9" disc diams.

B&D PORTABLE GRINDERS
prepare surfaces for welding; smooth welds, snag and grind castings, remove rust, scale, old paint, cut off old rivets, studs, bolts; grind, clean and buff frames, cabinets, etc. 5" and 6" wheel diams.

They're powerful and portable!

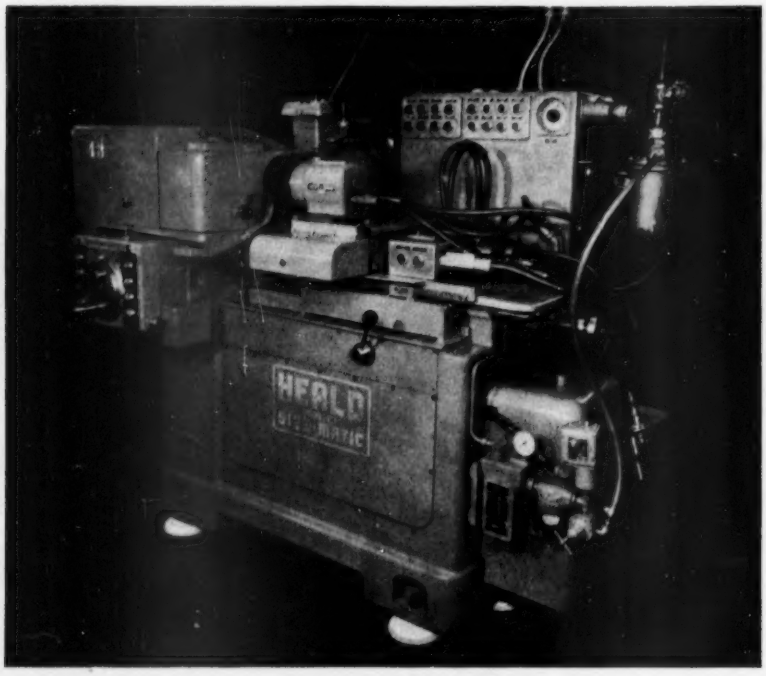
NO MATTER how big or bulky your abrasive jobs, you'll cut costs and speed up work when you switch from hand methods to Black & Decker power! B&D Sanders drive abrasive discs, saucer grinding wheels, "Whirlwind" wire cup brushes, gouging and planing heads. B&D Portable Grinders drive grinding wheels, "Whirlwind" wire wheel brushes, cotton buffing wheels. And *both* give you: (1) Dependable, full-powered motors tailor-made by Black & Decker for the tools they drive; (2) Perfect balance for easy handling, less operator fatigue; (3) Tough, longer-lasting parts for extra years of service, lower tooling costs!

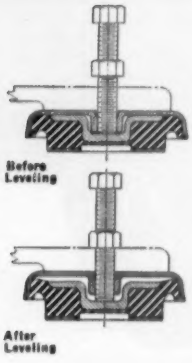
See your nearby B&D Distributor for demonstrations, expert help on any tooling problem. Write for free catalog of over 100 Electric Tools to: THE BLACK & DECKER MFG. Co., 602 Pennsylvania Ave., Towson 4, Maryland.

BD

Protect the Accuracy of Your Machines with these

NEW *leveling* BARRYMOUNTS





When chatter marks spoil your finishes, vibration from an outside source may be to blame. It may come from punch presses in another part of your plant, or it may come from passing traffic or from heavy machinery next door.

But building-borne vibration can't destroy the accuracy of your grinders if you set them on the new Leveling Barrymounts.

They isolate your precision grinders from building-borne vibrations that can cause chatter marks.

They absorb vibrations that destroy precise machine adjustments.

They keep shock and vibration from causing inconsistent operation of delicate controls.

Barrymounts cut your costs

by stopping spoilage due to vibration. They're low in cost—and backed by a money-back performance guarantee. Just tell us the make and model of your grinders and we'll tell you how to protect their precision. And write for bulletin showing the additional advantages of these cost-cutting Leveling Barrymounts.

THE **BARRY** CORP.

736 PLEASANT ST., WATERTOWN 72, MASSACHUSETTS

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BOOKS

For All Executives

COMMUNICATION IN MANAGEMENT

By Charles E. Redfield. The University of Chicago Press, 5750 Ellis Ave., Chicago 37. 290 pp. $3.75.

As modern business organizations become more complicated, improved techniques of internal and external communications are a must. Mr. Redfield's book is concerned with internal, or administrative communications.

The author feels that administration cannot be divorced from communications —which to a large extent coordinate the internal functions of a modern company.

He devotes a complete section to the theory of administrative communications in the belief that more is needed than a mere understanding of the techniques. This he hopes will serve as a basis for critical analysis whenever current techniques succeed or fail and will support the introduction of new techniques.

The book is in five sections. The first is introductory —describes types of information handled, and establishes guiding principles for more effective communications.

The second section treats communications from supervisor to subordinate and from central headquarters to branch offices.

The third deals with upward and inward communications, reporting being the most important example.

The fourth emphasizes horizontal communciations, with special attention focused on the processes of clearing, reviewing, and conferring.

The final section is concerned with the theory of administrative communication.

Turn the page

listen...

to shop talk

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BOOKS

Begins on page 322

AUTOMATIC CONTROL OF HEATING AND AIR CONDITIONING

Here's a practical book on automatic controls as they apply to the air conditioning and heating fields. The author, a vice-president of Minneapolis-Honeywell Regulator Co., explains and illustrates basic problems and the principles applied in solving them. Actual control devices shown are unidentified as to manufacturer, so the reader can better concentrate his attention on the priniciples they illustrate. By John E. Haines. McGraw-Hill Book Co., 330 W. 42nd St., New York 36. 370 pp. $6.75.

MOTIVATION AND MORALE IN INDUSTRY

Jammed full with information on sources of motivation and determinants of morale in industry. Emphasis is placed on the application of research findings to increase employee productivity, job satisfaction, and morale. British and American experimental studies and attitude surveys in this field are described in detail. By Morris S. Viteles. W. W. Norton & Co., Inc., New York. 510 pp. $9.50.

WELDABILITY OF STEELS

Gives the complete story of welding carbon and low alloy steels. Starting with relationship of welding processes and metallurgy to weldability, the book discusses factors influencing weldability, outlines methods of welding commonly used on steels, and gives a review of weldability tests. By Robert D. Stout and W. D'Orville Doty. Welding Research Council, 29 W. 39 St., New York. 381 pp. $6.50.

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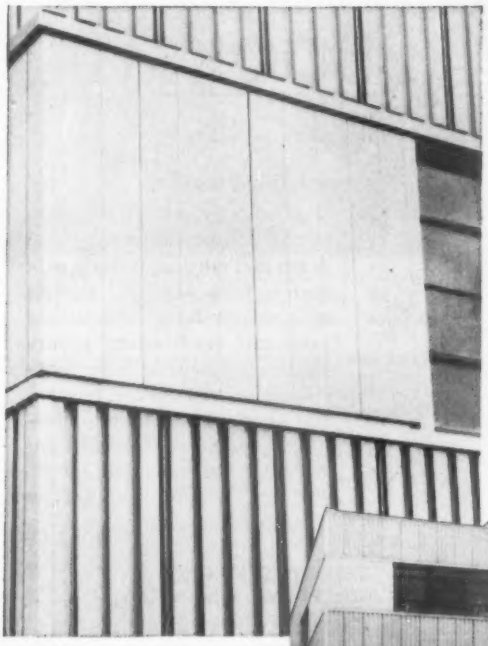

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BOOKS

Begins on page 332

SUPERVISING PEOPLE

This book is written for anyone in a supervisory position. A revised edition, it deals primarily with practical aspects of supervision, discussing problems confronting supervisors and telling how some supervisors succeeded in solving them. Lists many additional books and articles for further study. By George D. Halsey. Harper & Bros., New York. 238 pp. $3.

CASE STUDIES IN COLLECTIVE BARGAINING

Cases are the main feature of this book. Explanatory material is kept to a minimum. A thorough analysis of each phase of collective bargaining is omitted, thus leaving many problems for the reader to solve himself. By Walter H. Carpenter, Jr. Prentice-Hall, Inc., New York. 465 pp. $4.95.

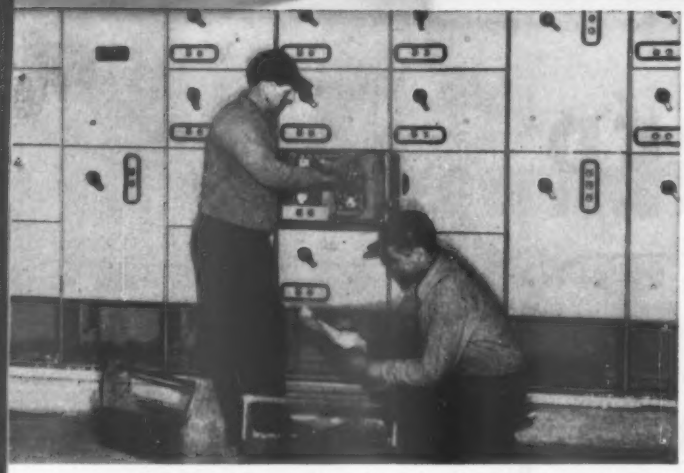
TAX SHELTER IN BUSINESS

A gathering of strategies and policies through which a business can hope to hold its own and even to grow in the face of today's tax structure. By William J. Casey and J. K. Lasser. Business Reports, Inc., Roslyn, N. Y. 156 pp. $12.50.

LABOR PROBLEMS: CASES AND READINGS

Although written primarily as a text, this book contains valuable information for every member of the operating group who has contact with union men and officials. Contains sections by men in labor as well as management. By George P. Schultz and John R. Coleman. McGraw-Hill Book Co., 330 W. 42 St., New York 36. 456 pp. $4.50.

Turn the page



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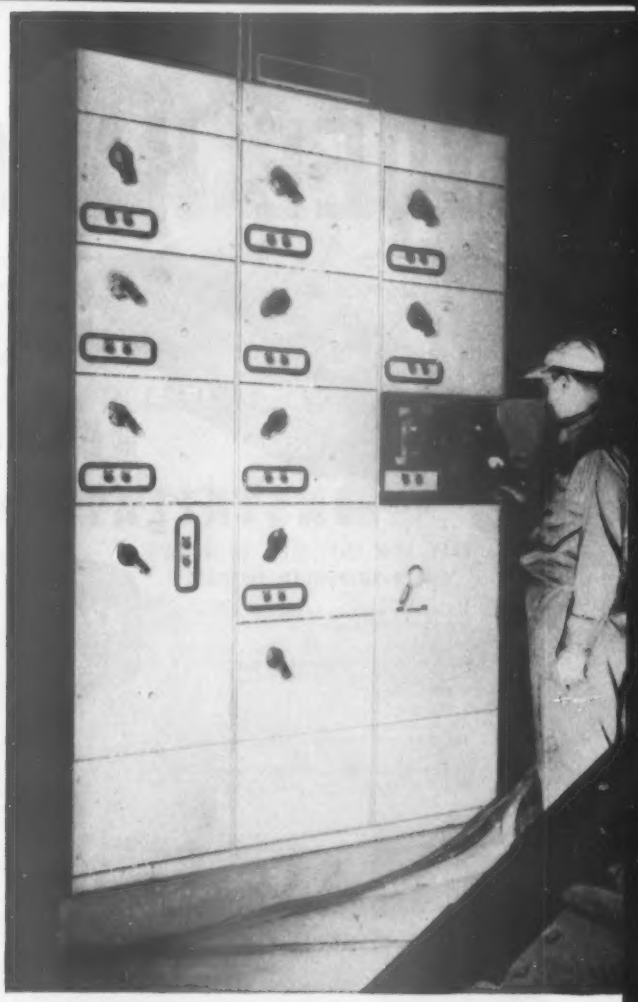

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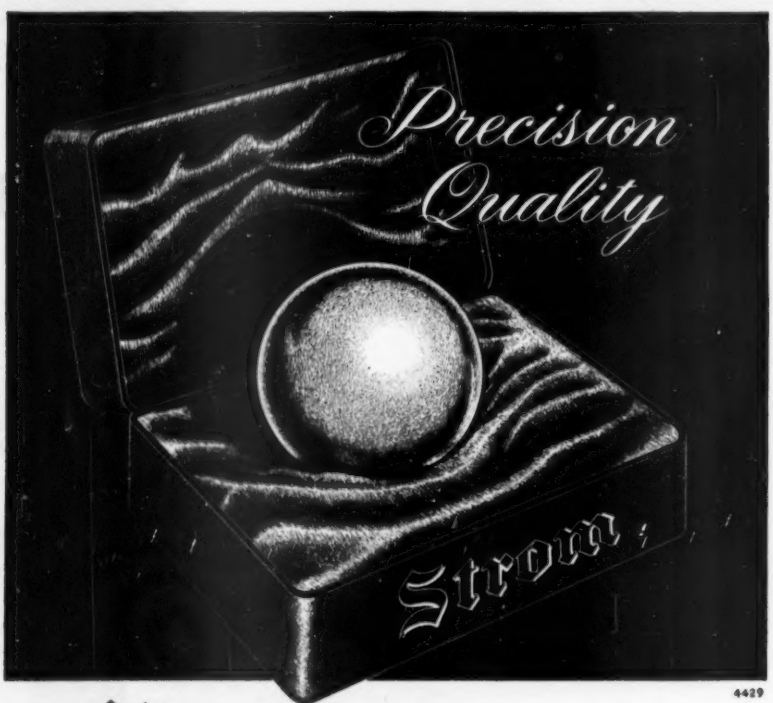

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BOOKLETS

Begins on page 322

INDUSTRIAL LIGHTING. A good guide for plant engineers with lighting problems. Reprint of American Standard Practice for Industrial Lighting compiled by the Illuminating Engineering Society. Bureau of Labor Standards, Washington, D. C. 40 pp. Free.

WELD STANDARDS. To help machinery manufacturers establish cost and quality control over welding operations. The Lincoln Electric Co., Cleveland 17, 16 pp. $1.

FIRE SAFEGUARDING WAREHOUSES. Technical Survey No. 1. Better fire prevention and protection of warehouse and storage facilities have become a must, as a result of increasing inventories and stockpiling of strategic materials.

This short booklet is filled with data that could save you money and goods. The National Board of Fire Underwriters, 85 John St., New York 38. 48 pp. Free.

MAKING THE MOST OF YOUR HUMAN RESOURCES. Has a section on organization of the manufacturing executive's job that should interest many of FACTORY's readers. Rest of booklet deals with better employee utilization. American Management Association, 330 W. 42 St., New York 36. 76 pp. $1.25.

CUTTING-OFF WHEELS. This booklet covers the use, classification, machine and wheel speeds, and mounting of cutting-off wheels. Grinding Wheel Institute, 221 N. LaSalle St., Chicago. 19 pp. Free.

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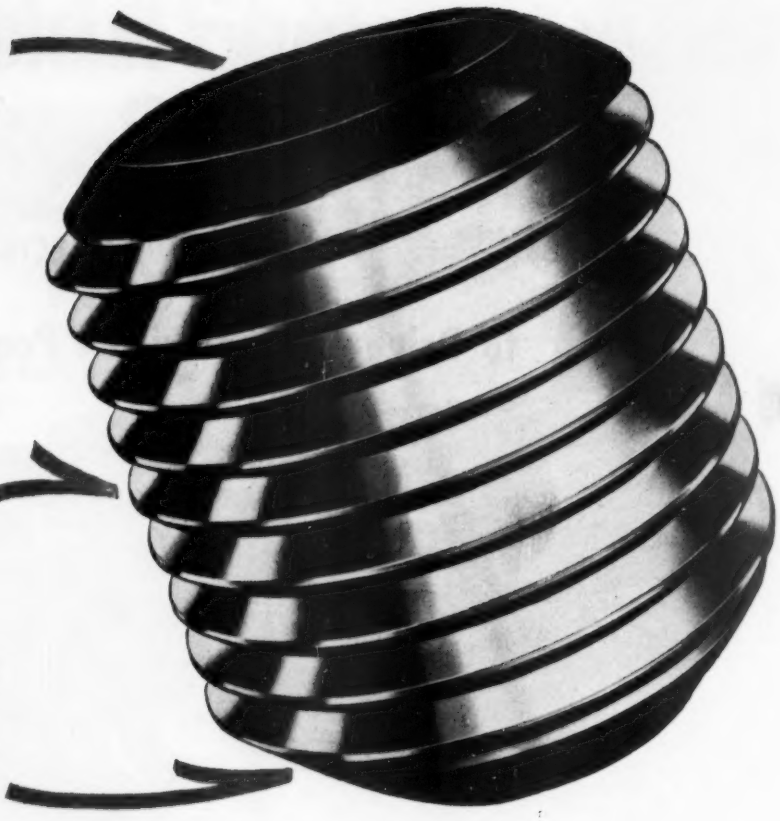

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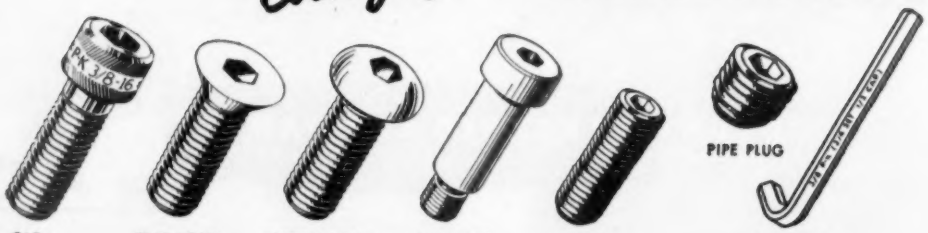

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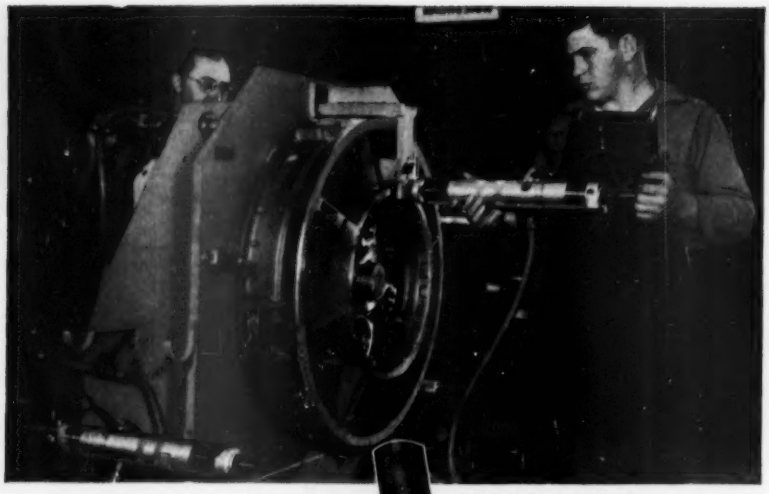

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A. O. Smith Corp., P. O. Box 584, Milwaukee, Wis.

SAFETY IN THE PLASTICS LABORATORY deals with safe compounding of vinyl plastics on the two-roll mill. Demonstrates step-by-step operation of the two-roll mill with emphasis on accident hazards and necessary safety measures. Sound film strip, black and white, 10 min. For free loan, write:

Bakelite Co., Div. of Union Carbide and Carbon Corp., 30 East 42nd St., New York.

RIGHT ON THE NOSE shows the proper procedures for fitting different types of industrial safety goggles, stressing need for individual fitting for each worker. Of interest to safety engineers and management. Sound, black and white, 15 min. Free.

American Optical Co., 2 Mechanic St., Southbridge, Mass.

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Begins on page 342

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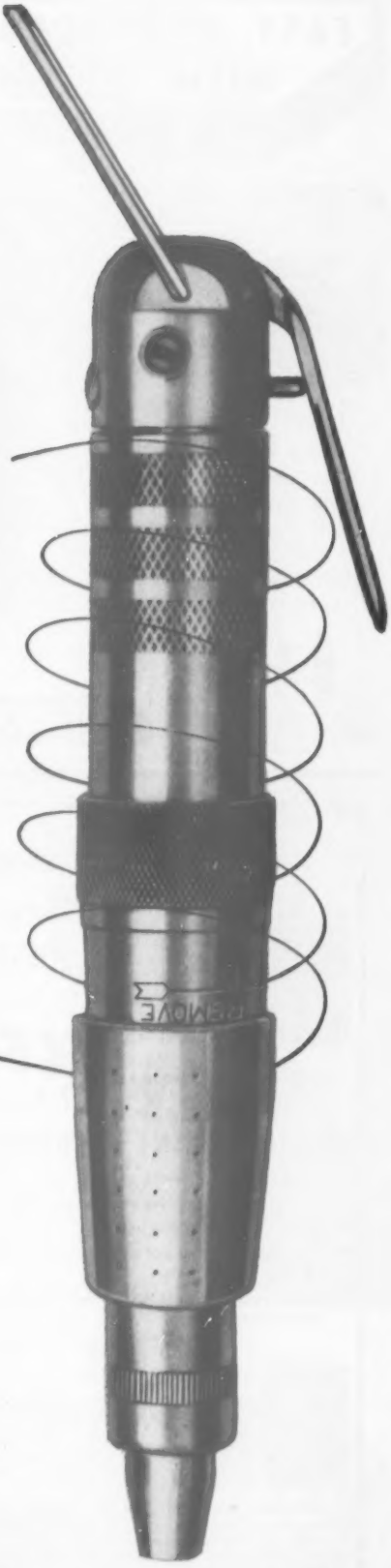

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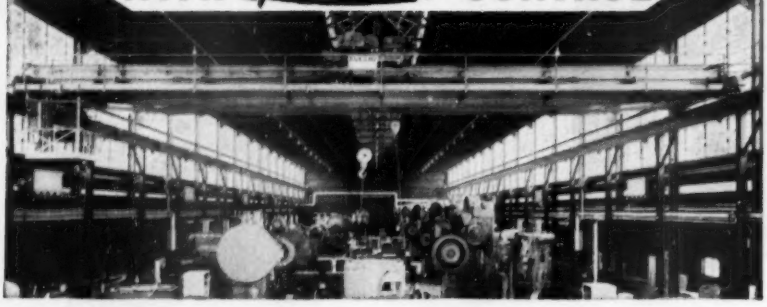

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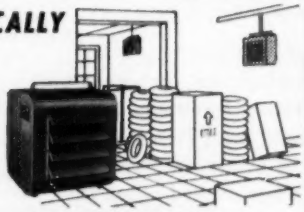

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Completely SAFE! Only Electromode has the cast-aluminum, sealed-in heating element and built-in safety switch. No danger of fire, shock or burn. No over-heating.

Approved by Underwriters' Laboratories

EXPLOSION-PROOF HEATERS for heating hazardous areas subject to explosion. In three sizes: 2000, 4000, 6000 watts. Model CX-2 illustrated.

For complete information write:

ELECTROMODE CORPORATION

45 CROUCH ST. ROCHESTER 3, N. Y.

Leader in electric heaters since 1929

INDUSTRIAL FILMS NOW AVAILABLE

Begins on page 342

sign in the light of sound motion economy principles. Explains why a particular design is inefficient and how it can be improved. Of interest to industrial engineers, time and motion study men, tool designers, and production engineers. Color, silent, 60 min. For free loan, write:

General Motors Corp., 3044 West Grand Blvd., Detroit 2.

MACHINE TOOLS AND MOTIONS demonstrates time and motion principles as applied to machine tool controls. Emphasizes proper placement of controls and need for designers to consider both worker and machine. Series of before-and-after sequences show improvement of controls. Sound, black and white, 13 min. Available free from:

General Motors Corp., 3044 West Grand Blvd., Detroit 2.

A STUDY OF METAL BAND SAWS AND FLAT GROUND STOCK illustrates the industrial use of this equipment. Shows selection of correct band saw for specific job, working of the saw, how the cutting compound acts, and the welding and annealing of metal band saw blades. Color, sound, 30 min. Free. Write to:

Simonds Saw and Steel Co., 470 Main St., Fitchburg, Mass.

PHOTOGRAPHIC STUDIES OF WELDING ARCS presents a slow motion study of various welding arcs under different conditions of amperage and using different electrodes. An excellent analysis of the subject, and of interest to those in the welding field from student to research worker. Silent, color, 18 min. Available free from:

Reid-Avery Co., Baltimore 22, Md.

Minimize costly equipment stoppages by standardizing on new

Rome 50

Neoprene sheathed flexible cords

Chances are you have a great many dollars invested in the electrical tools and equipment in your plant.

You can easily see why it will pay you to protect this investment, plus protecting yourself against costly plant downtime and production lags by standardizing on reliable flexible cords.

For most equipment services you can count on new Rome 50 flexible cords to give you dependable service and long cord life. Their Neoprene jackets are specially compounded and vulcanized to give greater protection against sunlight, acids, oils, moisture, abrasion and flame. This careful processing also gives you a more flexible cord that is easier to handle.

Available in Types SO and SJO, Rome 50 Flexible cords are economically priced as a companion line to Rome's quality-proven Rome 60 heavy-duty cords and portable cables.

When you need portable conductors specify Rome . . . Rome 50 for regular service . . . Rome 60 when the service is tough.

It Costs Less to Buy the Best

ROME CABLE
Corporation
ROME · NEW YORK
and
TORRANCE · CALIFORNIA

ROME CABLE ROME, N.Y.

Gives white hot steel the "kid glove" treatment

GIGANTIC MACHINES with thousands of moving parts are used to shape white hot ingots into plates and sheets. All of these hard-working machine parts are subject to intense heat . . . normal in steel manufacturing. Because of the intense heat, lubrication is a serious problem.

U. S. Steel has tried various types of greases in order to eliminate the problem of oil burn-out. Now they're using a product of Shell Research, Shell Alvania Grease. Result: better lubricating action *at once*. Months after the original installations, rollers were removed and an excellent film of grease was still present.

At the other extreme, zero weather caused grease in an automatic lubricating system to congeal and become unpumpable. Shell Alvania was tried and clogging promptly stopped. This multi-purpose grease is now used extensively in low-temperature operations at U. S. Steel's Ohio Plant.

SHELL ALVANIA GREASE

- **resists oxidation**
- **will not squeeze out**
- **extends periods between overhauls**
- **provides exceptional lubrication in high or low operating temperatures.**

Shell Alvania Grease can cut down costly maintenance and save time and money in *your* plant. Write for technical information.

SHELL OIL COMPANY

50 WEST 50TH STREET
NEW YORK 20, NEW YORK

100 BUSH STREET
SAN FRANCISCO 6, CALIFORNIA

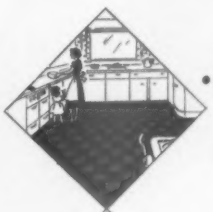
SHELL

What Are YOUR Flooring Needs?

...You're sure to find what you're looking for in the TILE-TEX Line!

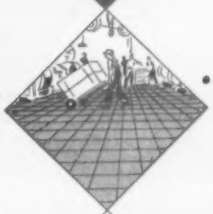
Choose from 4 distinct floor tile products; available in over 80 colors plus an exceptional selection of sizes and thicknesses. They can all be installed on or below grade—over wood or concrete.

Do you want a vinyl tile—the ultimate in resilient flooring? One that offers exceptional beauty . . . a choice of 28 bright, rich colors? A greaseproof tile that resists acids and alkalis? Do you want a floor that's exceptionally easy to clean and keep clean—that never requires waxing?



...You can't beat FLEXACHROME* VINYL PLASTIC-ASBESTOS FLOOR TILE!

Do you want a greaseproof tile that's made especially for industrial areas subjected to grease and oil abuse? A *heavy-duty* floor that takes plant traffic, lubricating oils, food and kitchen greases? Do you want a tile that withstands rolling friction including a reasonable amount of trucking . . . that brightens up drab interiors and has a safe, sure walking surface?

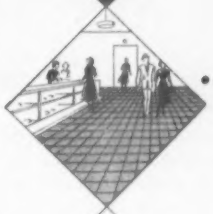


...Your best bet is TUFF-TEX* GREASEPROOF INDUSTRIAL FLOOR TILE!

Do you want a light-colored, greaseproof floor tile with high resistance to food, greases, and oils? Colors that have exceptionally high light reflectivity? Do you want a floor that's economical to maintain—that requires only the usual sweeping, periodic washing, and occasional water-waxing?

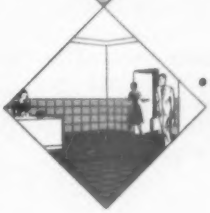
...There's nothing like VITACHROME† GREASEPROOF RESILIENT FLOOR TILE!

Do you want a low-priced, high quality asphalt tile? One that combines beauty with durability, minimum maintenance, and long service? Do you want a tile that has a long established reputation for satisfactory performance?



...Your answer is TILE-TEX* ASPHALT FLOOR TILE!

Do you want a flexible tile wall covering—one that's ideally suited for commercial, industrial, or residential wainscoting and walls. A greaseproof wall covering that resists acids and alkalis. Do you want a wall that never needs painting or redecorating and is easy to keep clean?



...Nothing compares with MURA-TEX* PLASTIC-ASBESTOS WALL TILE!

See your Tile-Tex Contractor...

listed in your classified telephone directory for complete information. Or write:

THE TILE-TEX DIVISION, *The Flintkote Company, 1234 McKinley Street, Chicago Heights, Illinois.*

Tile-Tex—Pioneer Division, *The Flintkote Company, P. O. Box 2218 Terminal Annex, Los Angeles 54, Calif.*

The Flintkote Company of Canada, Ltd., *30th Street, Long Branch, Toronto, Canada.*

†Trademark *Registered Trademark, The Flintkote Company

TILE-TEX... *Complete* Flooring Service

What coatings protect you best against WEATHERING and RUST?

It depends upon your problem.

Under most conditions, count on EMULSION type asphaltic coatings to protect metal and masonry against weather and corrosion.

. . . *particularly* the special asphalt blends such as Flintkote's HYDRALT* Emulsions.

This type of coating provides you with many advantages over melted asphalt or solvent cut-back types for application over concrete, steel and weathered asphalt coatings.

HYDRALT Protective Coatings are unique mineral colloid asphalt emulsions which provide a durable, thick film *reinforced within itself* . . . won't sag or flow under heat...won't alligator. They're non-flammable and non-toxic.

Where resistance to oil, grease or other petroleum solvents is a problem, use Flintkote ORTAR* Emulsion Coating, a coal tar type.

Choose from Flintkote's *complete line* of cold-applied coatings for water, dampness and corrosion control. Each product is designed for meeting specific protection requirements. Available for brush, spray or trowel application.

Wouldn't you like to know more about these protective products?

You can read all about them in Sweet's . . . or write us for complete information.

• • •

THE FLINTKOTE COMPANY, *Industrial Products Division*, 30 Rockefeller Plaza, New York 20, N. Y. 55th & Alameda Sts., Los Angeles 54, Calif.

In Toronto, Ontario: THE FLINTKOTE COMPANY OF CANADA, LTD.

In London, England: Industrial Asphalts Company, Ltd.

*Reg. U.S. Pat. Off.

Over 50 years' specialized experience

At your service . . . by phone, mail or personal call. No obligation.

FLINTKOTE

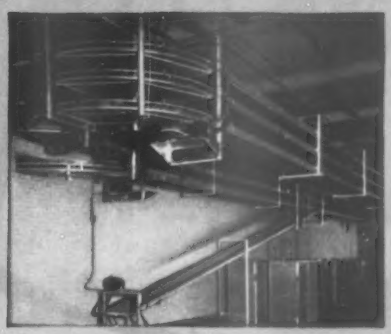
Products for Industry

USP WENDWAY

Automatic answer to your "light product" conveying problems!

If you have a light product, 20 lbs. or less . . . if you must move it smoothly, efficiently, from one process to the next . . . if you want an *automatic selective conveyor system* to do the job dependably and at consistent savings in time and manpower . . . then Wendway is for you!
Wendway specializes in moving light goods swiftly, quietly and safely anywhere throughout your plant or warehouse. Standardized, self-powered sections may be operated by remote control to eliminate man hours all along the way. Wendway can be installed overhead or in multiple tiers to save your floorspace . . . will pass through walls, go upstairs or down. Whether your problem is assembly, processing, packing, orderpicking or checking, you'll find Wendway pays for itself from the day it starts to work.

PACKAGING OR ASSEMBLY operations can be synchronized to production, thanks to Wendway's variable speeds. Here fancy nuts are Wendwayed from bag loaders through a series of stapling machines and on to loading boxes. Steel wire belt is clean, easy to keep clean.



OVERHEAD COOLING for cooked or heated products saves you time and floorspace. Wendway takes 'em up, cools 'em off and brings 'em down, ready for further processing. Individual gearhead motors can be remote controlled to give you a completely automatic operation.

LOADING OPERATIONS get a big boost with selective Wendway tiers reaching exactly the areas you want, when you want them, from any part of your plant. Wendway passes through walls, goes up, down or around. Versatility of standardized sections keeps installation costs low, maintenance costs lower.

Wendway's special steel wire belting rides smoothly over powdered iron sprockets mounted on sturdy steel shafting. Cannot slip or run out of line. Easy to clean and keep clean.

Belt track and channel of heavy gauge steel, galvanized for longer life and appearance. Sturdy leg structures of galvanized steel angle frames bolted and welded. Exclusive pure Nylon belt guides and bearing strips for quiet, friction-free operation.

Individual ¼ h.p. gearhead motors synchronize each Wendway section to required speeds. Drip-proof, sanitary. Equipped with magnetic starters and start-stop station buttons.

Formed steel guards for all chain drives and sprockets protect equipment and personnel. Hinged for ready access to working parts for inspection or maintenance.

Detailed information on Wendway is available on request. Our conveyor engineers are also at your service. Let them show how quickly Wendway could cut costs for you.

UNION STEEL PRODUCTS COMPANY
ALBION, MICHIGAN
1903 *Our Golden Anniversary* **1953**

SYMBOL OF QUALITY USP

We've Got Life!

TWO EXTRA-DUTY CATHODES AT EACH END GIVE ME ENDURANCE. YOU'LL GET TWICE THE AVERAGE LAMP-LIFE FROM ME!
I'VE GOT EXTRA VITALITY BECAUSE OF MY STRONGER, LONG-LIFE FILAMENT
DURO TEST
DURO-TEST
10000 USER HOURS

"Built Stronger to Burn Longer"

If longer lamp-life meant only one kind of saving it would be worth making. But actually it means *two* . . . lamp economy and—even more important—*low-cost maintenance.* With fewer replacements Duro-Test lamps give you substantial savings in man hours!

Duro-Test representatives are factory trained by engineers to give you complete personalized lighting service. *Write for details today!*

DURO-TEST CORPORATION

North Bergen, New Jersey

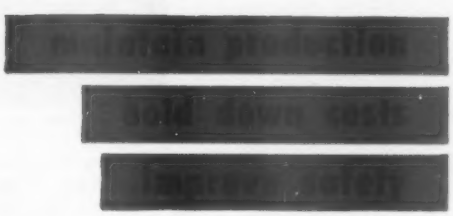
© Duro-Test Corp.

than a Long Life Plant Floor

View of Masterplate Floor in the American Radiator & Standard Sanitary Co. plant, Buffalo, New York. Archt.—Prack & Prack, Pittsburgh, Pa.; Contr.—Shirley Herman Co., Buffalo, New York; Floor Contr.—The Vannier Co., Buffalo, New York.

MASTERPLATE "Iron-Clad" Concrete Floors

wear 4-6 times longer... help to



Section of Masterplate Floor.
Note Thickness of Armored Surface.

Management men are realizing more and more that the plant floor should be the last place to cut costs when building a new plant.

An expenditure *at the time of installation* of a few cents more per square foot for a Masterplate "iron-clad" concrete floor has paid dividends in plants the country over . . . helping to maintain a smooth flow of production, reduce maintenance expense and improve plant safety.

Only with Masterplate can you obtain a Masterplate "iron-clad" concrete floor with its important advantages* . . . 4-6 times more wear-resistant than the best plain concrete floor, spark-safe, non-dusting, corrosion-resistant, easy-to-clean and non-slip.

Full information on Masterplate — for new floors and resurfacing old concrete floors — and "see-for-yourself" demonstration kit supplied upon request . . . without cost or obligation.

• • •

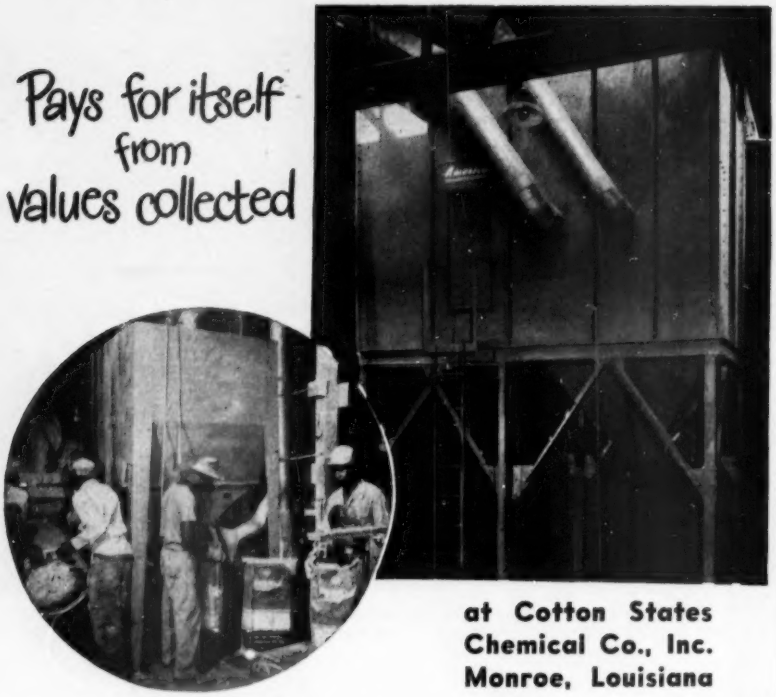
*. . . because only Masterplate contains the cement-dispersing agent calcium lignosulfonate which makes it possible to easily float a pound or more of the tough, ductile metal on fresh concrete and *keep it at the surface.*

the MASTER BUILDERS Co.

Subsidiary of American-Marietta Company

DUSTUBE salvages agricultural chemicals

Pays for itself from values collected



at Cotton States Chemical Co., Inc. Monroe, Louisiana

Three Dustube Collectors are being used by the Cotton States Chemical Co. in the manufacture of Agricultural Chemicals. One Dustube ventilates the work areas around the blenders and "sack-off" stations. A second Dustube ventilates a mill grinding Benzene Hexachloride and DDT. A third Dustube handles exhaust air from a cyclone ventilating a mill grinding concentrates such as toxaphene and aldrin.

"We installed these collectors to regulate the dust in the air, a nuisance to us and our neighbors besides being a fire and health hazard," writes Mr. L. P. Harris, Mgr. "We are paying for the units by the values collected and returned to the products. At least $50.00 worth of material is salvaged per day in the second and third Dustubes and about a third as much in the first. We have been very well satisfied with their efficiency."

The Dustube is the efficient, low-cost way to ventilate chemical processing operations of all types. You will want to read about its 10 advantages in the new catalog, just released. Write today for your copy of catalog No. 372.

American WHEELABRATOR & EQUIPMENT CORP.

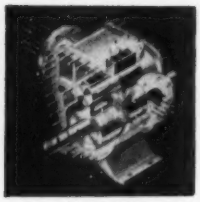
dustube® COLLECTORS

374 S. Byrkit St., Mishawaka, Ind.

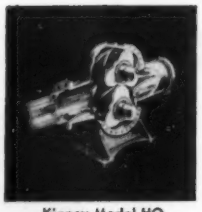
For more facts circle 571 on Reply Card

ROTARY POSITIVE DISPLACEMENT PUMPS

When liquids must be handled at fixed rates of flow, it pays to install a Kinney Rotary Liquid Pump. These are furnished in two basic designs — the famous Model SD Rotating Plunger Pump and the unique Model HQ Heliquad Rotary Pump. Each design has specific advantages which make it the "pump of choice" for certain services. For instance, in barge and tanker service, the Kinney Model HQ Pump has the unusual ability of handling all viscosities from gasoline to heavy molasses. For handling viscous materials such as asphalt, grease, soap, etc., the Kinney Model SD is the outstanding favorite.



Kinney SD Rotating Plunger Pump.



Kinney Model HQ Heliquad Rotary Pump.

Tell us about your process pumping problems. We will gladly give you full details on Kinney Rotary Positive Displacement Pumps.

Kinney Manufacturing Co., manufacturers of liquid and vacuum pumps. Representatives throughout the United States and in foreign countries.

For Bulletin L51 describing Kinney Rotary Liquid Pumps, write Kinney Manufacturing Co., 3624 Washington Street, Boston 30, Mass.

Kinney — A SUBSIDIARY OF THE NEW YORK AIR BRAKE CO.

See us at the Chemical Show

Booth #950
Convention Hall
Philadelphia
November 30 — December 5

Can you expect 38 years of service life from your silent chain drives?

Morse Silent Chain Drive on one of eight elevating legs. Drive is 12" wide x 1" pitch. This is one of eight Silent Chain Drives just replaced after 38 years of service.

Western Maryland Railway Company uses over three miles of belt conveyors in the big grain elevator shown below.

Sixty-five Morse Silent Chain Drives transmit power from motors of from 5 to 100 hp. to drive the belts which lift 15,000 bushels of wheat per hour or deliver 90,000 bushels per hour.

Long, long service life

Morse equipment was used in the original installation of the elevator over 38 years ago. The Morse Silent Chain Sprockets are still the original ones. So are the majority of the Morse Silent Chain Drives. The exceptions: The chain on the eight elevating legs and the chain on one of the long delivery belts were just replaced. Also, in 1922 an explosion wrecked a few drives, which were replaced and have been operating only 31 years.

See your Morse Distributor

Morse Silent Chain Drives are ruggedly built around the exclusive Morse Rocker Joint. They transmit power smoothly, noiselessly, with over 99% efficiency. Service life is unusually long and trouble free.

Do you want to reduce machine-down time? Want exceptional service life from your power transmission equipment? Want to reduce cost per hour of power transmission? Then see your local Morse Distributor about Morse Stock Silent Chain Drives —or Morse Roller Chain Drives, Morse Morflex Couplings, Morse Chain Couplings, and other Morse stock products. Look under "Chains" or "Power Transmission" in phone directory's yellow pages.

MORSE CHAIN COMPANY

Dept. 578 • 7601 Central Avenue • Detroit 10, Michigan

*

Long Service Life, Engineering Service, Quality—which you get in unusual degree when you buy Morse Power Transmission Products.

MORSE

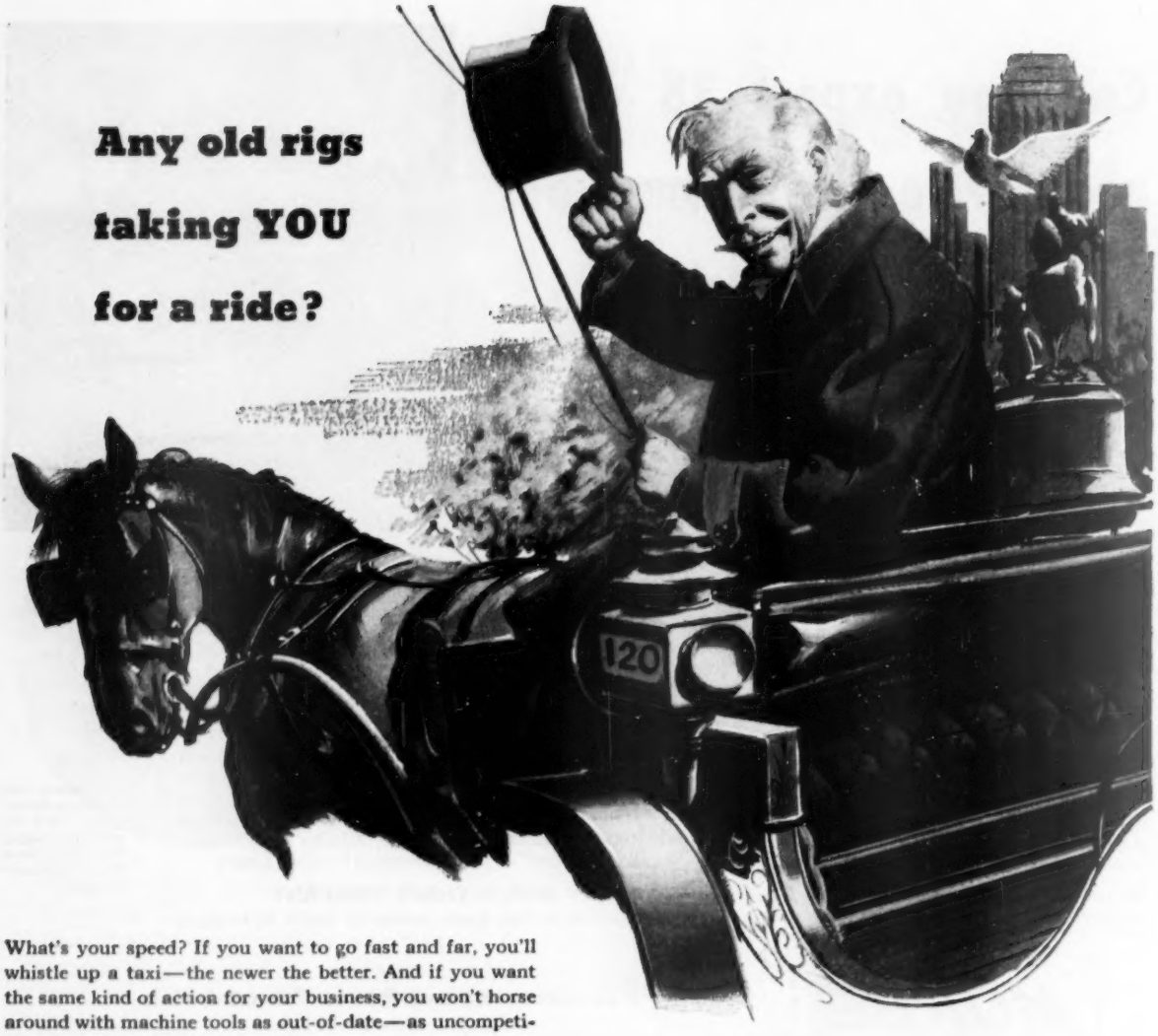
MECHANICAL *POWER TRANSMISSION* PRODUCTS

BW

M=PT; Morse *means* Power Transmission

Arrows indicate housings for long delivery belts. One belt is 1745', another 1690', four others between 700' and 750'. All are powered by Morse Silent Chain Drives.

Any old rigs taking YOU for a ride?



What's your speed? If you want to go fast and far, you'll whistle up a taxi—the newer the better. And if you want the same kind of action for your business, you won't horse around with machine tools as out-of-date—as uncompetitive—as this Victorian hot-rod.

OR DO YOU? More old lathes than you'd think are still ambling along in America's plants. Some of these are old at a comparatively youthful age. For every new machine that raises productivity and thus lowers costs, makes every less efficient one obsolete.

We submit that, unless you now use new Monarch lathes, you can't be sure of your position until you have secured comparative job studies. Do that—check the figures—and *know* where you stand. Then you'll discover full justification for getting down to cases with our sales engineers—acting on the proved business principle that it is machines, not dollars, that keep a plant competitive.

In other words, to keep ahead of competitive traffic, let us give you the facts so you will be certain to choose a fast, profitable production ride. Ask for brochures, catalogs, movies and job studies . . . ***The Monarch Machine Tool Company, Sidney, Ohio.***

FOR A GOOD TURN FASTER . . . TURN TO MONARCH

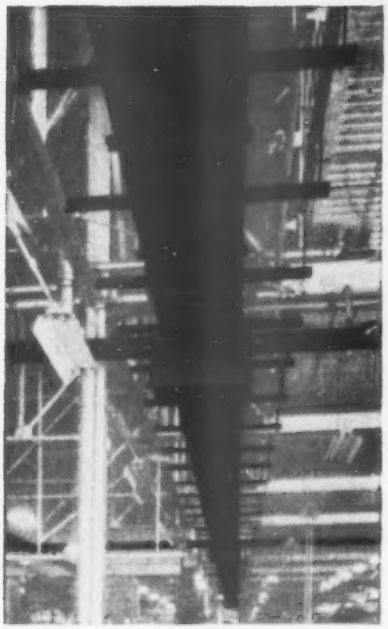
Monarch

ACCURACY • ECONOMY • LONG LIFE •

TURNING MACHINES

GREATER PRODUCTIVITY of Monarch lathes stems from our continuous development and research program. It has, for example, been responsible for the Air-Gage Tracer method of cost reduction (above) which has received such widespread acceptance.

BULLDOG BUStribution® DUCT



Prefabricated 10' sections and standard fittings give Ventilated LO-X Duct complete flexibility. 800A. to 4000A. at 600 volts or less.

Economical
• to install
• to operate

For faster, easier, more economical installation of duct sections, BullDog LO-X BUStribution DUCT uses the scarf-lap joint—a thoroughbred engineering feature that pays off in extra savings for you.

With BullDog's exclusive scarf-lap joint (shown above), duct sections simply overlap and bolt together . . . making a stronger, more rigid assembly. Bulky, complicated joint fittings are eliminated. Savings in time and money are substantial.

Another great economy feature, BullDog's unique paired phasing arrangement, lowers reactance in the bus bars. It assures you the *lowest possible* current carrying cost per ampere per foot.

Get complete information on LO-X Duct (for feeder and welder circuits) and Plug-in Duct (for branch circuits). Consult your nearest BullDog Field Engineer —offices in principal cities throughout the United States and in Canada. Or write BullDog Electric Products Company, Dept. FM-103, Detroit 32, Mich.

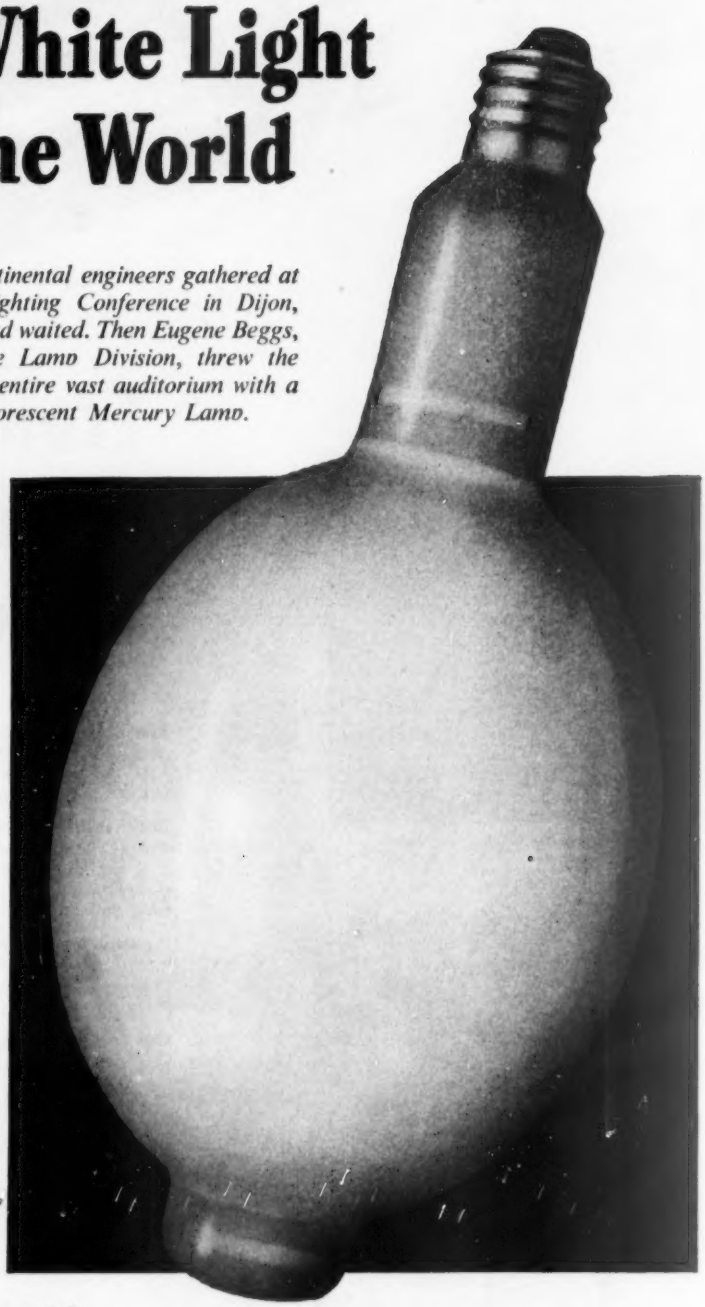
© BEPCO

THOROUGHBRED IN ELECTRICAL EQUIPMENT

BULLDOG
ELECTRIC PRODUCTS COMPANY

International Engineers Applaud Cheapest Source Of Mass White Light In The World

Several hundred continental engineers gathered at the International Lighting Conference in Dijon, France, sat quietly and waited. Then Eugene Beggs, of the Westinghouse Lamp Division, threw the switch—lighting the entire vast auditorium with a single 1000 watt Fluorescent Mercury Lamp.



OVER 10 TIMES THE LIGHT HOURS OF AN INCANDESCENT

This lamp converts the formerly wasted ultraviolet energy of the mercury arc to visible light. The result is *white light* from a Mercury Lamp. It gives 2½ times the light of an incandescent of equal wattage. And it has an average rated life of 5000 hours . . . 5 times that of a regular incandescent. The assembled Europeans applauded. This was their first view of America's newest, most significant contribution to light sources.

LIGHTING COSTS DROP

European businessmen have long appreciated the economy of Mercury Lamps and have used them extensively for years. They know power costs drop because you get more light for less wattage. Maintenance costs drop, too, with fewer, longer-lasting lamps to replace. Americans now have all the advantages of mercury lighting plus white light without incandescents for color correction.

Free booklet tells how to reduce your costs

If you are concerned with lighting high bay areas in factories and terminal buildings . . . or railroad yards, parking lots and streets . . . Westinghouse Mercury Lamps can reduce *your* costs. The facts are in a 24-page booklet that's yours—free for the asking.

To get your copy promptly, write today to: Westinghouse Lamp Division, Dept. FM-10, Bloomfield, N. J.

YOU CAN BE SURE... IF IT'S

Westinghouse

WHY IT PAYS TO BUY STEEL FROM WAREHOUSE

You don't need to invest in expensive cutting equipment !

WHEN YOU BUY STEEL FROM WAREHOUSE YOU GET:

- LOWER INVENTORY COSTS
- LOWER SPACE COSTS
- LOWER TIME COSTS
- LOWER CAPITAL INVESTMENT
- FASTER PRODUCTION
- FEWER INVENTORY LOSSES

TYING up money in large, expensive steel-cutting machinery is something you can avoid, if you wish. Yet you can have your cutting done on the most modern equipment available. When you order your steel from U.S. Steel Supply, specify just how you want it cut. We will meet these specifications exactly. For example, our flame cutting equipment will follow the most complicated patterns without error and turn out finished shapes precisely as you want them. Your U.S. Steel Supply salesman will give you complete information about our cutting services.

U. S. STEEL SUPPLY

DIVISION

General Office
208 So. La Salle St., Chicago 4, Ill.

USS

Warehouses and Sales Offices Coast to Coast

UNITED STATES STEEL

ONE MAN *and* PALLETIER

Get materials where you want them . . . FAST!

Powerful, new Crescent Palletier, built for maneuverability speeds the steady flow of materials from receiving . . . through process . . . to warehouse or shipping. *RESULT*—drastic reduction in handling cost.

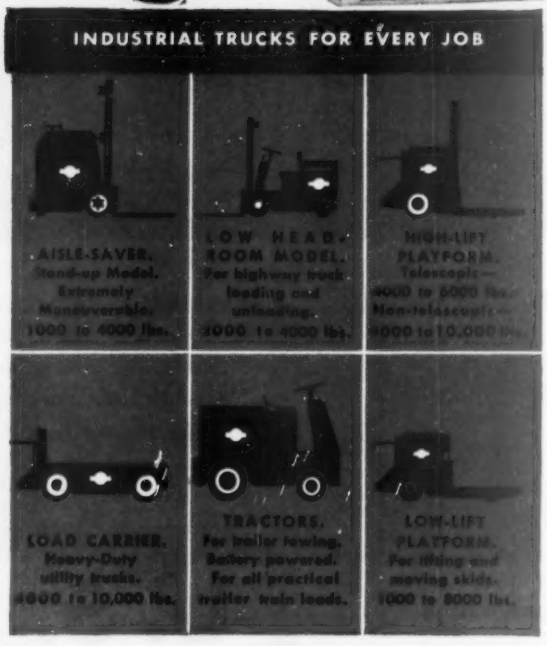
why 1 man does the work of 4

Simplified Controls reduce operator "breaking in" time—increase operating efficiency.

Hydraulic Brakes assure operator confidence—increase machine output. A big reason why Palletier daily production records are so high.

Complete Visibility. Operator has clear visibility in every direction whether loading, carrying or stacking. Less fatigue; more accurate work, higher operating speeds.

Palletier has electric or ready power units. 1000 to 8000 lbs. capacity.


INDUSTRIAL TRUCKS FOR EVERY JOB
AISLE-SAVER. Stand-up Model. Extremely Maneuverable. 1000 to 4000 lbs.
LOW HEAD-ROOM MODEL. For highway truck loading and unloading. 2000 to 4000 lbs.
HIGH-LIFT PLATFORM. Telescopic— 4000 to 6000 lbs. Non-telescopic— 4000 to 10,000 lbs.
LOAD CARRIER. Heavy-Duty utility trucks. 4000 to 10,000 lbs.
TRACTORS. For trailer towing. Battery powered. For all practical trailer train loads.
LOW-LIFT PLATFORM. For lifting and moving skids. 1000 to 8000 lbs.

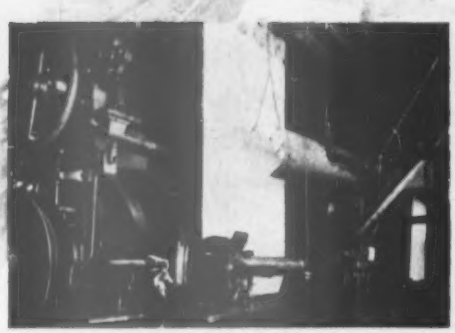
CRESCENT TRUCK COMPANY
1110 Willow Street
LEBANON, PENNSYLVANIA

CRESCENT PALLETIER SAVES MONEY

U. S. Army photo

AMAZING STRENGTH, TOUGHNESS of nylon is shown in new Army body "armor" used in Korea that reduced torso wounds by 60 to 70%. Twelve layers of flexible, spot-laminated nylon duck give protection that's superior, weight for weight, to steel.

STRONG, ACID-RESISTANT filter bags of "Orlon" acrylic fiber filter hot gases passing from a foundry cupola through this automatic dust control system. Bags withstand constant shaking, corrosive gases, 275°F. heat.



HIGH-STRENGTH, QUICK-DRYING "Dacron" makes possible continuous operation of these grieges used to blot up excess dye in cloth printing. "Dacron" grieges last up to 10 times longer . . . promise important annual savings. Nylon also is excellent for this purpose.

Now man-made fibers are improving products

. . . AND MAY WELL DO IT FOR YOU

Strength that makes possible improved products . . . increased efficiency . . . lower costs . . . comes from Du Pont's man-made fibers. These versatile raw materials offer you a range of properties never before available in fibers. They can perhaps answer a production problem for you . . . help you make your product better, just as they've done in the examples shown here.

Each of Du Pont's man-made fibers—nylon, acetate, "Cordura", "Orlon" and "Dacron"—has its own unique combination of properties. Each is uniform as only a fiber made by man can be. It will pay you to investigate them in terms of your own needs.

Write for full information, describing the uses you have in mind. E. I. du Pont de Nemours & Co. (Inc.), Room 2520-N, Wilmington 98, Delaware.

STRONG, STRETCH-FREE "Cordura" makes possible this lighter, long-lift conveyor belt that troughs better, virtually eliminates take-ups.

DU PONT

REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

Watch "Cavalcade of America" on television.

FIBERS TO FIT INDUSTRY'S NEEDS

NYLON

High strength wet and dry; elastic, shock-resistant, high flexibility. Resists deterioration from oils, alkalies. Tough, durable, lightweight. High abrasion resistance.

CORDURA*

high tenacity rayon

High strength with low cost, low bulk; high resistance to stretch; resistance to heat. This high tenacity rayon has toughness, good durability and flexibility.

ORLON*

acrylic fiber

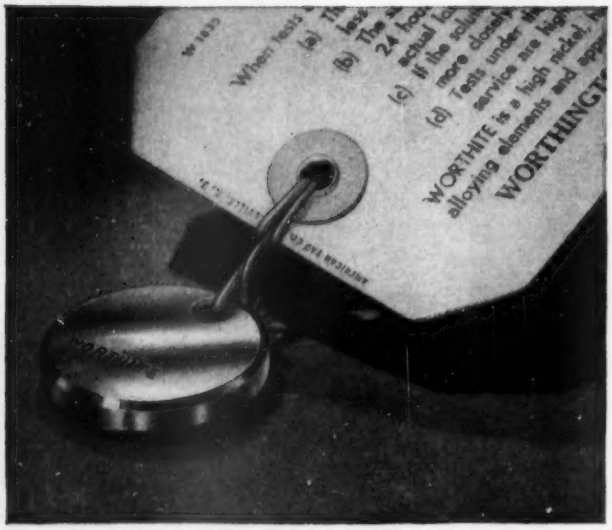
Dimensionally stable; strong wet and dry; low moisture absorption; resistant to sunlight, mildew and weather exposure. High resistance to acids and other solvents.

DACRON*

polyester fiber

High strength wet and dry; outstanding heat resistance; good chemical resistance; stretch resistance; good electrical insulating properties. Withstands abrasion, flexing.

*DU PONT TRADE-MARK

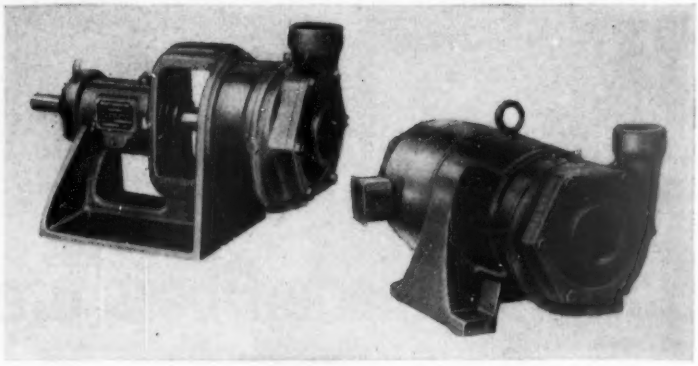


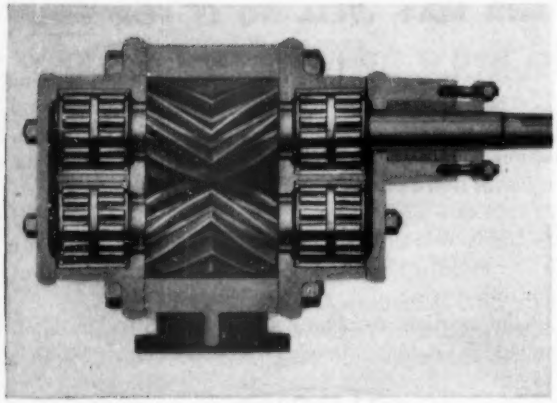
Which of these pumping problems is costing you money?

Pumping problems can cut into your plant's production and profits—or they can be solved by selecting the most efficient pump for each job. To aid in this sometimes difficult selection, Worthington offers complete lines of every major type pump. Here are three examples of the way Worthington design overcomes specific pumping problems.

⬆ CORROSION?

A number of years ago, Worthington's chemical engineers developed the high-nickel, high-chromium, molybdenum alloy, Worthite. The complete line of Worthite chemical pumps withstands a wider range of corrosives, yet sells for less than most stainless steel pumps. Write for a free sample of Worthite to test in the various solutions your pumps may be called on to handle.





⬆ SPECIAL JOB CONDITIONS?

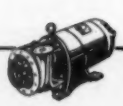
Worthington's standardization of parts, mountings, materials and dimensions gives you 60,000 centrifugal pump combinations (frame-mounted and Monobloc types) from which to choose the one that meets your needs exactly. This unequalled selection of *standard* pumps eliminates the slow, costly custom manufacture of the correct centrifugal pump for every job.

⬅ HIGH VISCOSITY?

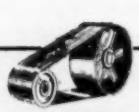
Worthington rotary pumps use herringbone gears to handle viscous liquids at capacities up to 5000 gallons per minute against pressures to 500 psi. The herringbone gear design eliminates end thrust, trapping, and produces smooth, pulsation-free flow. Four heavy-duty roller bearings placed close to the load prevent shaft deflection.

For further information on Centrifugal, Rotary or Worthite pumps, see your local Worthington distributor, or write to Worthington Corporation, Pump and Compressor Merchandising Division, Section PC.3.11, Harrison, New Jersey. PC.3.11

COMPRESSORS: AIR-COOLED, WATER-COOLED



PUMPS: CENTRIFUGAL, ROTARY, STEAM, POWER



MULTI-V-DRIVES: QD SHEAVES AND V-BELTS

VARIABLE SPEED DRIVES: WORTHINGTON ALLSPEED

WORTHINGTON

Standard Pumps

Buy these Worthington standard products from your local distributor

The Oil That Says:

"CAN DO!"

High V. I. PUROLENE proves perfect in hundreds of uses

The *qualities* built into Purolene are what give it such a broad, multi-purpose usefulness.

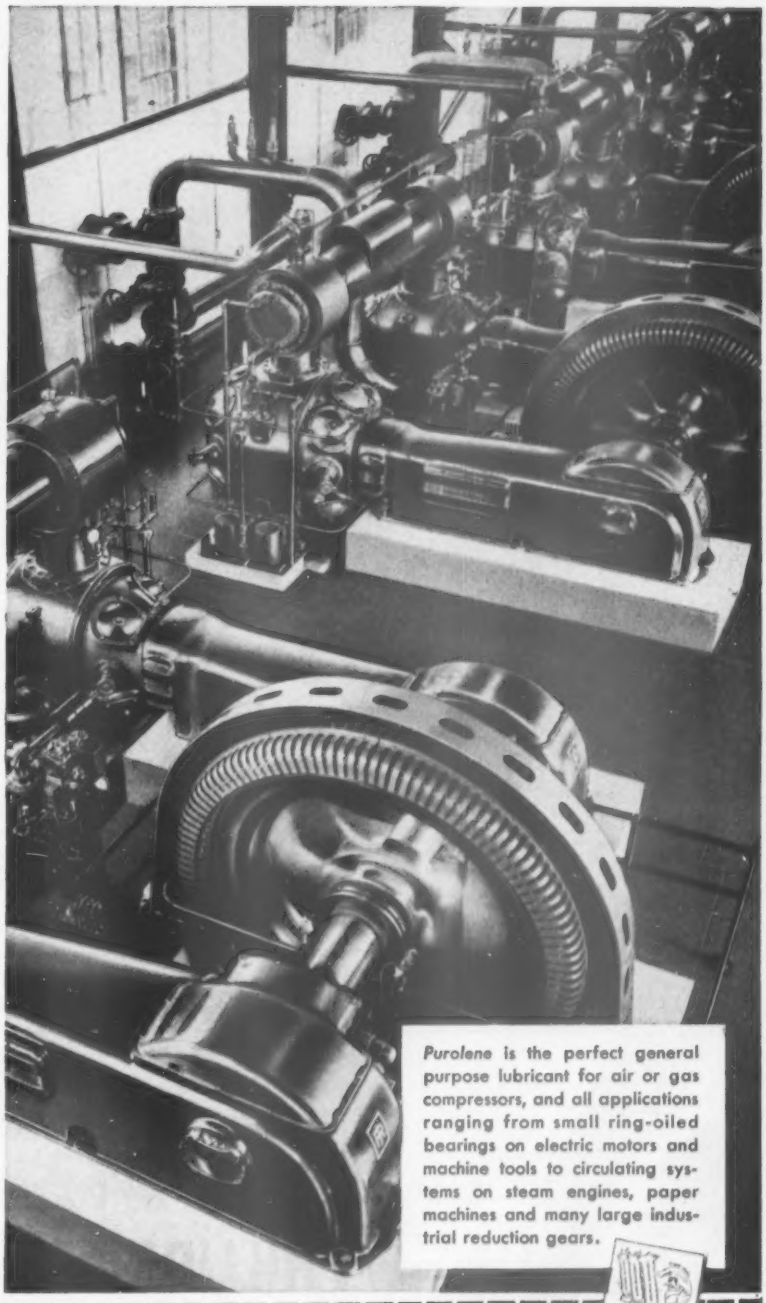
Expertly refined from a superior paraffin crude, Purolene has 100 plus V.I., high flash and fire, low pour, high resistance to oxidation and offers protection against rust.

Purolene is one of a group of Pure Oil *multi-purpose* industrial lubricants, each designed to do many different jobs equally well. You can use them to simplify your lubrication practice and reduce your lubricants inventory.

So effective is the multi-purpose character of the lubricants in this group that *seldom more than six are needed to do the entire lubrication job for even a large plant!*

Learn how to use this versatile line to start a new labor-saving, money-saving lubrication program in your plant. Use the coupon below.

KEEP IT PURE AND SIMPLE!



Purolene is the perfect general purpose lubricant for air or gas compressors, and all applications ranging from small ring-oiled bearings on electric motors and machine tools to circulating systems on steam engines, paper machines and many large industrial reduction gears.

PURE OIL INDUSTRIAL LUBRICANTS

FREE BOOKLET

The Pure Oil Company, Industrial Sales Dept. F 310
35 E. Wacker Drive, Chicago 1, Illinois

Please send me your free booklet on how to "Simplify and Save."

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ADDRESS_____

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Be sure with Pure Sales offices located in more than 500 cities, including: Atlanta . . . Birmingham . . . Charleston . . . Charlotte. . . Chattanooga Chicago . . . Columbus . . . Indianapolis . . . Jacksonville . . . Madison . . . Memphis . . . Miami . . . Milwaukee . . . Minneapolis . . . Norfolk . . . Pensacola . . . Pittsburgh . . . Richmond

What's Screwy? by Phillips

"Oh, he never bothers to turn it on. He's just fascinated by the beauty of those Phillips Cross-Recessed-Head Screws."

PERFECTLY MATED! Only Phillips Drivers are perfectly mated to Phillips Screws. Look for the name Phillips on the shank.

BEAUTY is only one of many reasons why Phillips Screws help you build a better product. These screws set up tighter, resist vibration. They are distinctively designed to give maximum strength of head, maximum driver strength. What's more, they cut driving time up to 50%, eliminate driver skids and split screw heads. Whether you use Phillips Wood, Machine, Tapping Screws or "Sems", you save time, work, money.

PHILLIPS *Cross-Recessed-Head* SCREWS

X marks the spot... the mark of extra quality

AMERICAN SCREW COMPANY • ATLANTIC SCREW WORKS, INC. • THE BLAKE & JOHNSON CO.
CENTRAL SCREW COMPANY • CONTINENTAL SCREW COMPANY • THE EAGLE LOCK COMPANY
ELCO TOOL AND SCREW CORPORATION • GREAT LAKES SCREW CORPORATION • THE H. M. HARPER CO.
THE LAMSON & SESSIONS COMPANY • NATIONAL LOCK COMPANY
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PHEOLL MANUFACTURING CO. • ROCKFORD SCREW PRODUCTS CO. • SCOVILL MANUFACTURING CO.
SHAKEPROOF DIV. OF ILLINOIS TOOL WORKS • THE SOUTHINGTON HDWE. MFG. COMPANY
STERLING BOLT COMPANY • STRONGHOLD SCREW PRODUCTS, INC. • WALES-BEECH CORP.

TODAY'S... AND THE FUTURE'S... FINEST FASTENER

Durasheath: for lower-cost power distribution

DURASHEATH* is a light, tough cable. It is easily installed and thoroughly dependable for series or multiple street lighting, traffic control, and airport† lighting, residential primaries and secondaries as well as for industrial plants and railroads. It may also be used as Type USE cable for underground service entrance.

DURASHEATH cable can save you money. You can run this flexible, easily handled cable underground (buried directly in the earth), overhead or in ducts (or in any combination of these) without needless, time-consuming jointing. Its light weight and flexibility make duct pulling fast even in zero weather. Aerial assemblies go faster. Linemen like to work with it.

* * *

As one of several types of ANACONDA power cables, DURASHEATH is available in all sizes, single or multiconductor, copper or aluminum, from 600 to 15,000 volts. *Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.*

*Reg. U. S. Pat. Off. 5311

†*when ordered to CAA Specifications L-824*

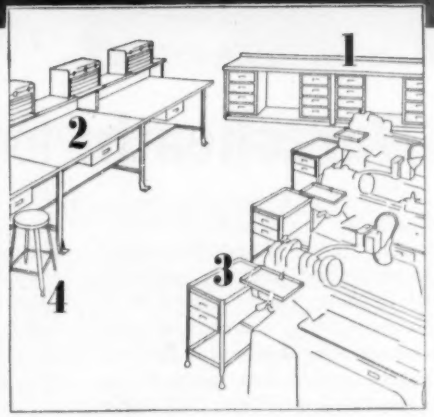
ANACONDA®

Primary and secondary distribution cables • building, machine tool, control and communication wire • portable cords and cables • bus-drop cables • apparatus cables • copper, aluminum, copperweld conductors • wire and cable accessories.

A MODERN TOOLROOM—CUSTOM BUILT with Standard HALLOWELL Shop Equipment

Design it as you want it—set it up with standard HALLOWELL Shop Equipment. Ample storage space provides protection for your tools and gages, promotes good housekeeping. Let us send you details—then order standard ready-made units from your nearest authorized HALLOWELL distributor. SPS, Jenkintown 11, Pa.

Our Fiftieth Year : A START FOR THE FUTURE



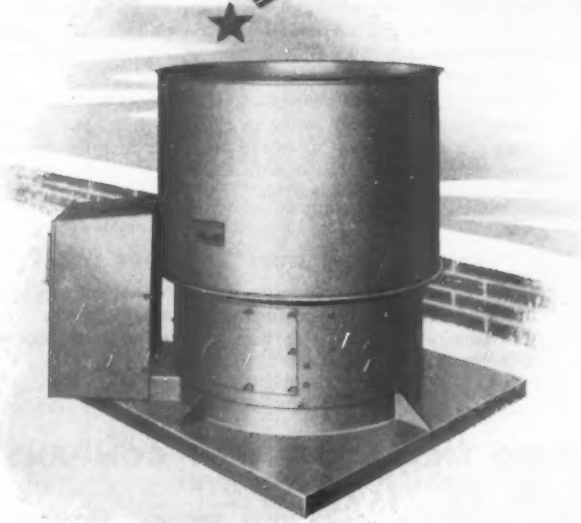
1. Cabinet Benches
2. Work Benches
3. Tool Stands
4. Adjustable Stools

HALLOWELL® SHOP EQUIPMENT DIVISION SPS JENKINTOWN PENNSYLVANIA

AMERICAN BLOWER
Power
Roof Ventilators

Hood type power roof exhaust or supply ventilator.

Upblast type power roof exhaust ventilator.



American Blower *power* roof ventilators give you the advantages of balanced ventilation, without the uncertainties of gravity units or the expense of a central system.

They're quickly and easily installed on all types of roofs. No extensive duct work is required; no valuable floor space is wasted. Use single units for spot ventilation; several units for large area coverage. American Blower power roof ventilators, supply or exhaust, are available in a wide range of capacities. They are designed to furnish balanced ventilation to industrial plants and commercial buildings.

Ask our nearest branch office for data.

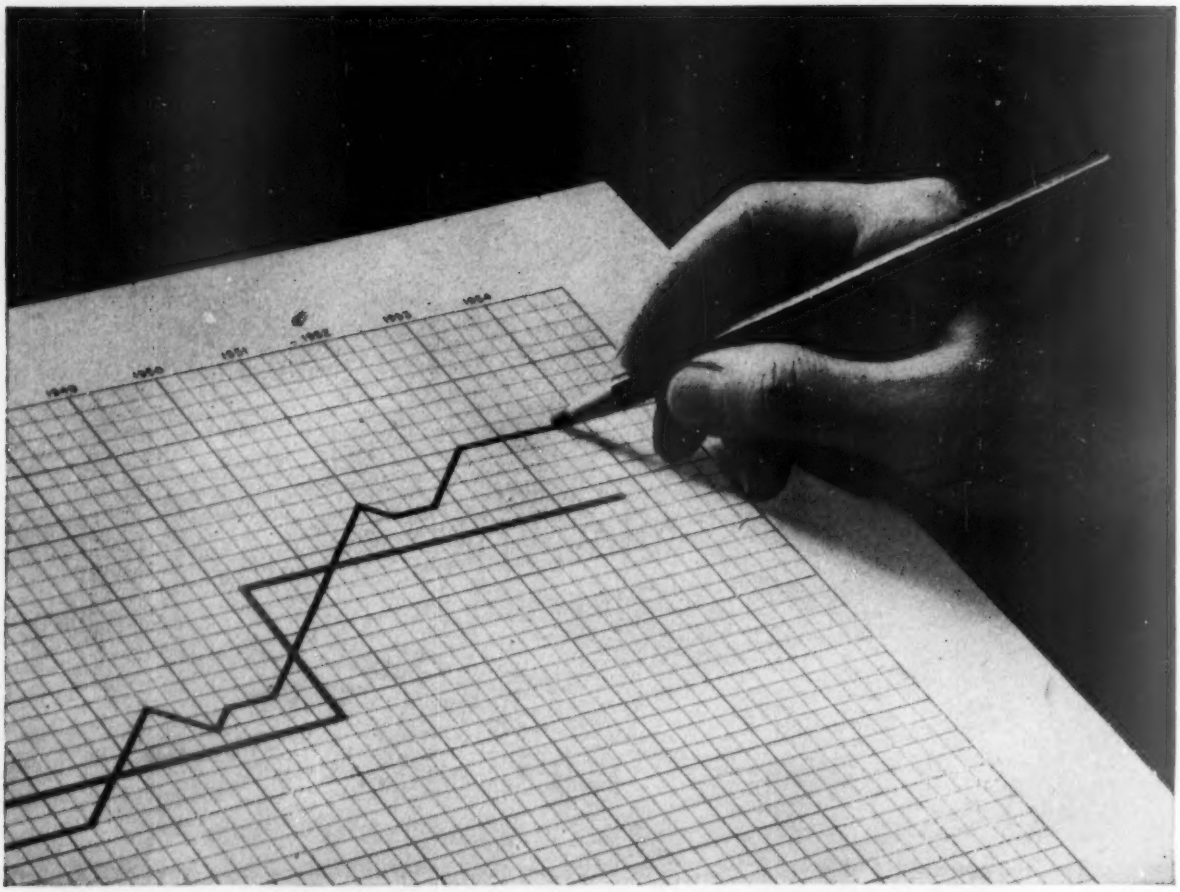
AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of American Radiator & Standard Sanitary Corporation

AMERICAN BLOWER

YOUR BEST BUY IN AIR HANDLING EQUIPMENT

Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS



Caution: dangerous curves

Keeping your fire protection properly balanced with changes in processes as well as ups and downs in production is vital to efficient, profitable operation.

You'll find your best answer to this serious fire problem which is currently confronting industry by installing an expansible, fully approved C-O-TWO Low Pressure Carbon Dioxide Type Fire Extinguishing System. Simple piping, running from one centrally located storage tank, instantly transports clean, non-damaging, non-conducting carbon dioxide anywhere in the plant area. Fire at any protected location is extinguished in seconds with an absolute minimum of expense and interruption.

Changes in your fire protection requirements are easily and economically provided for with a C-O-TWO Low Pressure Carbon Dioxide Type Fire Extinguishing System by initially installing an oversized storage tank and adding where necessary the supplementary discharge facilities at a later date.

Flexibility is the keynote . . . the low pressure carbon dioxide storage tanks range in capacity from one to fifty tons . . . discharge facilities can be either manual mechanical, manual electric, automatic mechanical, automatic electric or a combination of these . . . especially installed to fit your particular needs.

WHEN BUSINESS STOPS . . . INCOME STOPS!

Don't take chances with your investment. Secure the benefits of highly efficient fire protection engineering today... our extensive experience over the years is at your disposal without obligation. Get the facts now!

C-O-TWO

MANUFACTURERS OF APPROVED FIRE PROTECTION EQUIPMENT

Squeez-Grip Carbon Dioxide Type Fire Extinguishers
Dry Chemical Type Fire Extinguishers
Built-In High Pressure and Low Pressure Carbon Dioxide Type Fire Extinguishing Systems
Built-In Smoke and Heat Fire Detecting Systems

C-O-TWO FIRE EQUIPMENT COMPANY
NEWARK 1 • NEW JERSEY

C-O-TWO FIRE EQUIPMENT OF CANADA, LTD. • TORONTO 8 • ONTARIO

Sales and Service in the Principal Cities of United States and Canada

AFFILIATED WITH PYRENE MANUFACTURING COMPANY

☑ CHECK General Cable "POWER TWINS"

Modern, All-purpose Plant and Equipment Wiring

✓ **VARNISHED CAMBRIC INSULATED CABLES WITH INTERLOCKING ARMOR**

✓ **SAFETY m. i. WIRING SYSTEMS (Pyrotenax®)**

On any new plant construction job, the General Cable "Power Twins" provide today's modern, flexible wiring team for all power, lighting, control and machine tool applications. Can easily be shaped on the job. Especially economical and adaptable in close areas under and around beams and pillars.

- **VARNISHED CAMBRIC with Steel, Bronze or Aluminum Interlocked Armor**
  Designed for both high and low voltage power feeders.
- **SAFETY m.i. WIRING SYSTEMS (Pyrotenax®) Type m.i. 1953 Code Approved**
  A General Cable exclusive, offering a dramatic new advance in electrical wiring for all applications up to 600v. where heat, vapors, moisture, aging are of particular concern. Ideal for low voltage, lighting, power, control, machine tool and equipment uses. Lower installation costs, rigid yet flexible, and immune to age deterioration due to its "all mineral construction."

Your nearest General Cable representative can show you the many advantages of wiring with the "Power Twins." A call will bring him quickly, or write Headquarters.

Other General Cable Wires and Cables for Plant Construction Include:

Asbestos Varnished Cambric and all Asbestos Power and Control Cables

Super Service Portable Cords and Cables for power, lighting, control and machine tool leads to bussways, small tools in plants, etc.

Super Service and low-cost Welding Cables

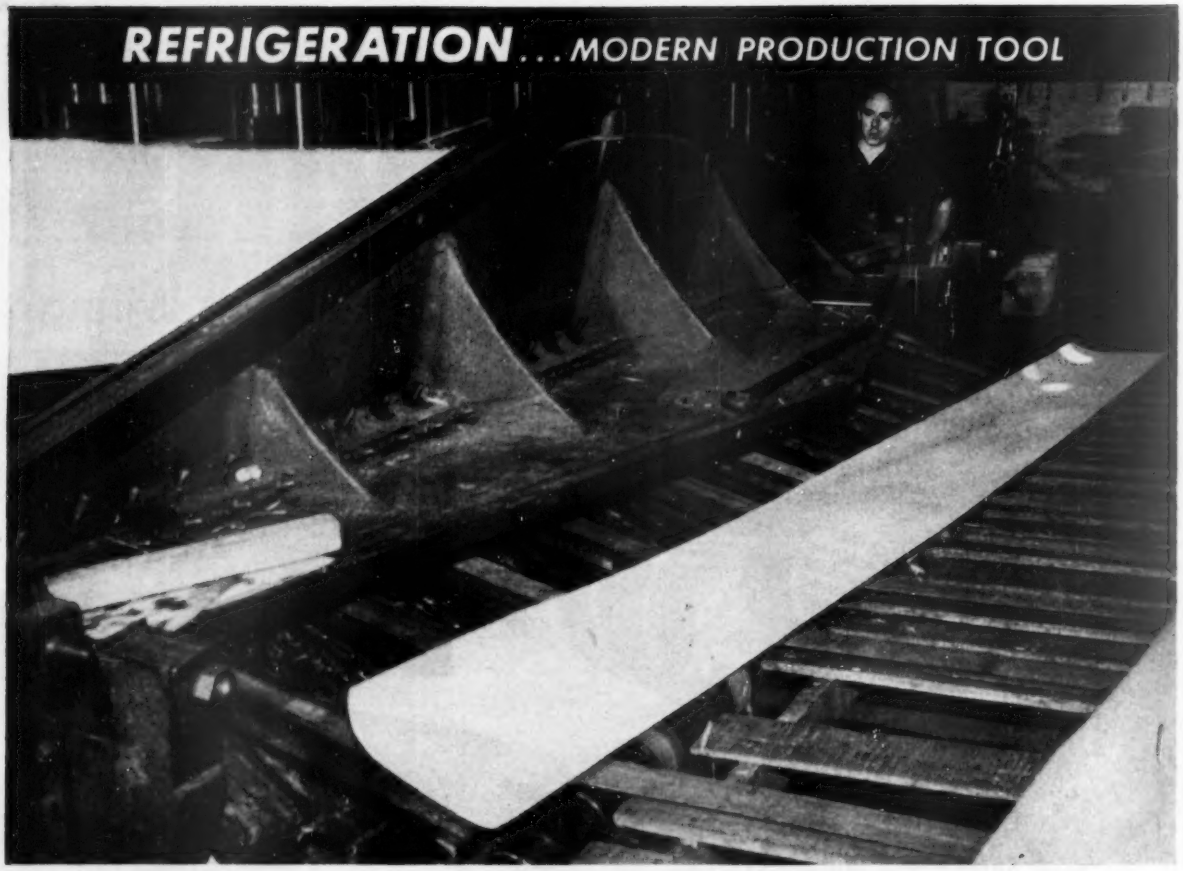
SUPERSHEATH "TRIPLETS"

- Type USE—Thermax W insulation with Neoprene Jacket for direct earth burial service entrance.
- Type RHWN—Thermax W insulation with Neoprene Jacket for aerial, duct, conduit and direct earth burial applications.
- Type GN—Gencorone (Corona resistant) Insulation with Neoprene Jacket for medium and high voltage applications—all types.

Rubber and Plastic power and control cables, Rubber or Gencorone (Corona resistant) or Plastic insulated with braided, leaded and armored finish. . . . and other types.

GENERAL CABLE
CORPORATION

Executive Offices: 420 Lexington Avenue, New York 17, N.Y. • Sales Offices in Principal Cities of the United States



Cooled logs keep veneer plant humming . . . even on hot days

In cutting basswood logs, the Birds Eye Veneer Company of Escanaba, Michigan, virtually shut down during summer months. When warm, basswood cannot be cut smoothly . . . its edges become rough, uneven. Machines such as the one pictured above won't function properly.

To remedy the situation, management conceived the idea of refrigerating the logs to make them cool enough for cutting. A cooler room . . . not unlike a butcher's walk-in cold-storage chamber . . . was constructed large enough to accommodate a carload of basswood logs. A 3 h.p. refrigerating compressor, operated with a Du Pont "Freon"* refrigerant, and three forced air cooling units were installed. These lower the room temperature to 28° F., and since the logs should be held under 40° F. for proper cutting, the equipment capacity is sufficient to cool down a full load of logs even on the hottest days.

Because the company can now operate full time throughout the year . . . regardless of outside temperatures . . . employment is steadier, production is up and both sales and profits have increased.

This is another typical example of how refrigeration (and air conditioning, too) are serving industry. Both aid in solving production problems . . . saving time . . . reducing costs . . . improving product quality . . . boosting employee morale. Possibly these twin tools of production can serve you as well.

Most modern refrigeration systems —large and small—are designed to operate with equipment charged with Du Pont "Freon" refrigerants. These are highly recommended because they're safe . . . noncombustible, nonexplosive, virtually nontoxic. They are made in strict accordance with scientific, laboratory-controlled methods insuring both the quality and uniformity for which "Freon" refrigerants are well known. Your engineers can readily select machines to meet specific requirements within your plant, office or home. Why not discuss the subject with them now?

A booklet: "How Air Conditioning and Refrigeration Benefit Industry" will be sent on request. E. I. du Pont de Nemours & Co. (Inc.), "Kinetic" Chemicals Div., Wilmington 98, Delaware.

KINETIC

*"Freon" is Du Pont's registered trade-mark for its fluorinated hydrocarbon refrigerants.

"Freon" Safe Refrigerants

REG. U.S. PAT. OFF.

DU PONT

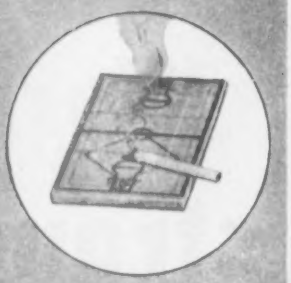
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

LET'S START WITH THE CAUSES OF *COSTLY FLOOR CARE*

Floor maintenance costs can be cut. Without skimping on protection. The way we help you do it is simple. First we look for the trouble spots that we've found are typical causes of extra expense. We analyze the treatments each of your floors has been getting. Then we cross-check these methods with those that have proved most successful in our years of experience with floors of all types, ages, conditions, and traffic situations.

After this analysis, we help you to organize your floor care on the most efficient basis. To set up a timetable for systematic cleaning, sealing, maintaining, and inspecting. To choose the particular products in West's broad line that will best fit your needs. At the right are a few examples.



Let's see how WEST products cut floor costs

West's broad line of floor products includes every item needed to clean, seal and maintain any type of floor. Economically! Here are three outstanding items.

LASTINCOTE

seals floors extra tight against dirt, oils, greases, scuff marks, scratches. Even a lighted cigarette won't mar the finish, although the wood underneath may char. Lastincote goes further and lasts longer. Penetrates deep into pores of surface, creating a hard, antislip coat. Completely neutral. Impervious to strong alkalis, soaps.

LUSTRECLEAN

is a triple action cleaner. Cuts maintenance man hours by cleaning, deodorizing and lightly waxing in one operation. No rinsing! Excellent for wood, composition tile, asphalt tile, linoleum, cement, terrazzo, painted and varnished floor surfaces.

KWYKWAX

provides a hard, antislip coating. Dries to high gloss in 20 minutes. Resists wet rainy-day traffic. Lasts and lasts for extra savings.

WANT DETAILS?

Tear out this page and mail with your letterhead

Dept. 56

I'm interested in:

☐ A FREE booklet packed with floor know-how and tips that can save hundreds of man hours a year.

☐ A talk with a West expert about my special floor problems. No sales pitch. No obligation. Just discussion and a demonstration if I want it.

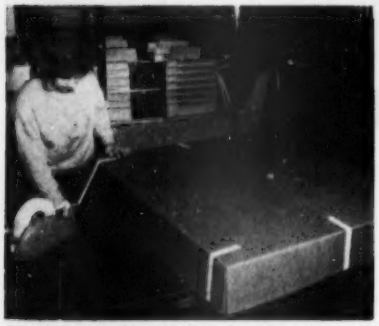
WEST DISINFECTING Company

West's broad line of products includes not only floor maintenance materials but also washroom service . . . disinfectants . . . deodorants . . . insecticides . . . cleaners . . . soaps . . . protective creams. West is also the exclusive distributor of Kotex Sanitary Napkins sold through vending machines.

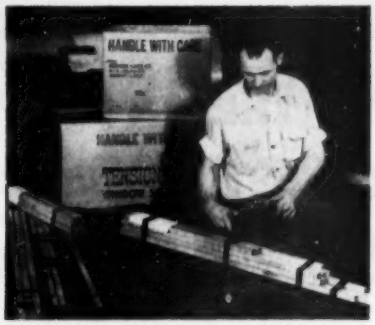
42-16 West Street, Long Island City 1, N. Y.

World's strongest tape?

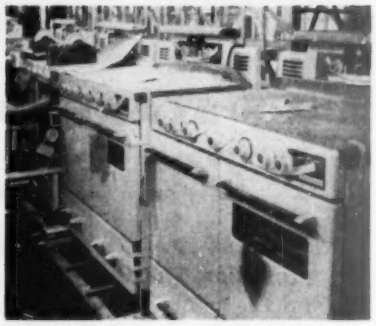
"Scotch" Brand Filament Tape takes over dozens of heavy-duty strapping, banding and bundling jobs around the plant.



REINFORCING: Only short strips of "Scotch" Brand Filament Tape are needed to reinforce huge shipping cartons. This tape sticks at a touch, holds tight to corrugated stock.



BUNDLING: Odd lengths of aluminum are kept in a tight bundle with "Scotch" Brand Filament Tape. Works equally well on tubing, conduit and heavy iron. Automatic dispensers available.



HOLDING: Stoves *taped* for shipping arrive without chipping! Appliance manufacturers find "Scotch" Brand Filament Tape reduces damage claims, speeds production.

PALLETIZING: A single strip of "Scotch" Brand Filament Tape around the top layer of cartons holds the entire load in perfect shape. Tape has tensile strength of up to 500 lbs. per inch of width.

APPLYING: Custom-built hand dispenser speeds application. For a FREE sample roll of tape for testing purposes, write Minnesota Mining & Mfg. Co., Dept. FMM-103, St. Paul 6, Minn.

Made in U. S. A by
MINNESOTA MINING & MFG. CO.
St. Paul 6, Minnesota

3M COMPANY

The term "Scotch" and the plaid design are registered trademarks for the more than 300 pressure-sensitive adhesive tapes made in U.S.A. by Minnesota Mining & Mfg. Co., St. Paul 6, Minn.—also makers of "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-slip Surfacing, "3M" Abrasives, "3M" Adhesives. General Export: 122 E. 42nd St., New York 17, N.Y. In Canada: London, Ont., Can.

One Sure Source

When electronic tubes fail, this purchasing agent knows exactly where to go and what to do to get replacements in the least possible time. He checks his Westinghouse Personalized Inventory Form.

Thanks to the salesman from his local Westinghouse Tube Distributor, this form assures him that a complete up-to-date inventory of his electronic tube needs is available and awaiting his phone call.

For instance: A company using electronic tubes in rectifiers, resistance welders, and motor controls cannot always keep a full inventory of replacement tubes. But the local Westinghouse Tube Distributor can keep such an inventory, IF the purchasing agent or maintenance engineer assists the distributor's salesmen in filling out a Westinghouse Personalized Inventory Form.

For sure protection against "down time" due to tube failure, ask your salesman of Westinghouse Electronic Tubes to complete a Tube Inventory Form for you. For your nearest distributor's name write Dept. F-110, at the address below.

ET-95035

YOU CAN BE SURE ... IF IT'S Westinghouse

RELIATRON™ TUBES

WESTINGHOUSE ELECTRIC CORPORATION, ELECTRONIC TUBE DIVISION, ELMIRA, N. Y.

"ENGINEERING ABILITY OF THE JANITROL MAN IMPRESSED US. WE BOUGHT 50 UNIT HEATERS."

Statement by Paul E. Olivier, General Supt. Great Southern Box Co., New Orleans, La.

Starting with 8 Janitrol Unit Heaters in their Wirebound Box Plant in 1942 the Great Southern Box Co., Inc., found this a practical and economical answer for their heating problems. Janitrol gas units kept installation costs to a minimum . . . no costly steam pipes were needed.

Plant expansion in 1944 required 12 additional Janitrol units for the new Corrugated Section . . . and in 1946, 27 similar units were installed in their new plant in Jackson, Miss. Several units have also been installed in their Cleated Corrugated Plant in Jackson, Miss.

Mr. Olivier said, "All of our heating requirements have been met with Janitrol Unit Heaters. There is no question that Janitrol engineering features assure long trouble-free service."

Sawdust in the air in the wooden box plant covers the Janitrol Units and makes occasional cleaning necessary—yet no maintenance problems have arisen, even under these rugged conditions!

Look into the *plus* features of gas heat with Janitrol for *your* needs!

All heating units are around the perimeter of the big 440' x 90' building.

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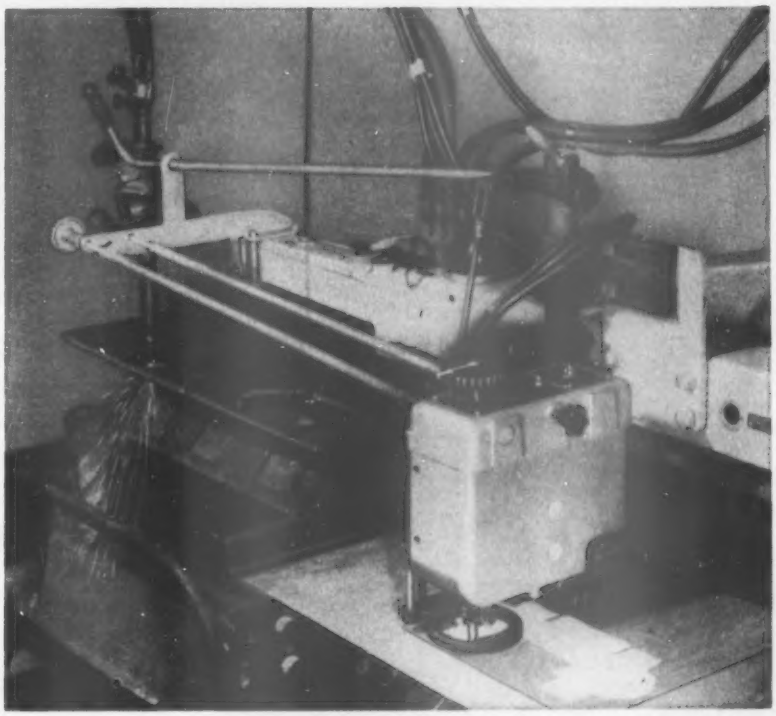

With an OXWELD Automatic Tracer to guide your oxygen-cutting machine, you need never forego the advantages of templet tracing because of time or cost. Whatever the shape—whether you need one piece or many—templet requirements are simple. Just draw your templet, full size, on a thin sheet of inexpensive plastic. Then cut it out with scissors or knife. It's that quick and easy. There's no tedious forming. To compensate for kerf width, just set a handy dial on the Tracer.

The OXWELD Automatic Tracer follows practically any templet shape within extremely close tolerances. It can also be used to hand trace directly from blueprints or drawings. Drive action is smooth and steady with both single- and multiple-blowpipe setups.

Your nearest LINDE representative will be glad to help you plan an OXWELD Automatic Tracer installation to fit either your present shape-cutting machine or one of the available OXWELD Shape-Cutting Machines.

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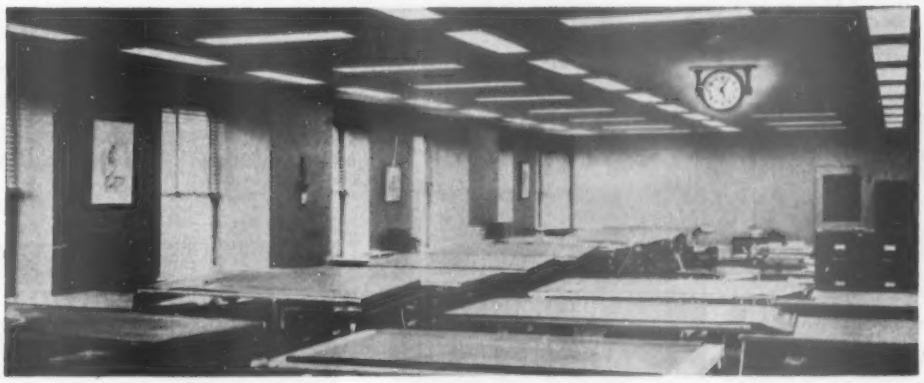

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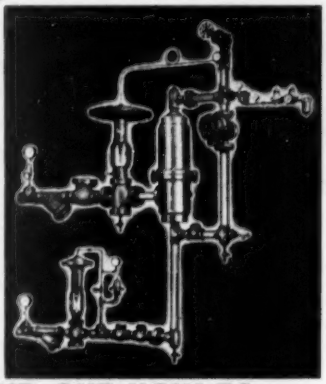

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Here's a typical example of saving money with Tape-Strap—laminated, reinforced filament tape.

Among the Lyon Metal Products Company's products is a 6-unit metal shelf, weighing 143 lbs. It's packed in a full telescope carton. Previous reinforcement was six 86" strips of rigid material, mechanically applied.

Two years ago, Lyon switched to Tape-Strap. Now, three 1" x 8" strips of Tape-Strap on each side provide all the reinforcement needed.

Packaging with Tape-Strap is easier, less dangerous to personnel, requires no special equipment, and saves 7.7% per unit over the previous packaging method.

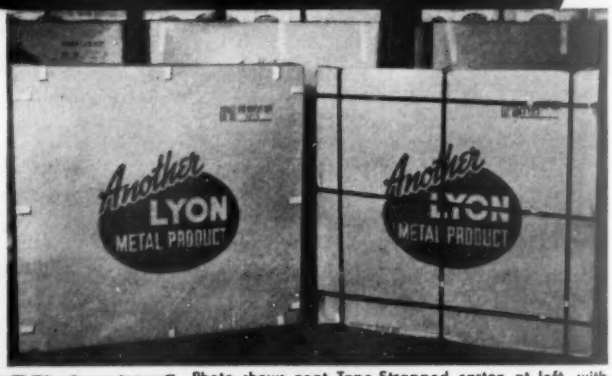

Photo shows neat Tape-Strapped carton at left, with previous packaging method illustrated at right.

You can't break Tape-Strap

This amazingly strong reinforcing tape has a central layer of thousands of tiny filaments embedded in resilient, shock absorbing material. This center is sandwiched between outer layers of tough, pliable Kraft. Adhesion is instant and permanent. Tape-Strap carries a super heavy coat of the finest, water-soluble gumming.

TAPE-STRAP is approved too! It is approved under Rule No. 41 and No. 5 of the Consolidated and Uniform Freight Classifications and various specific packaging items. It has also been accepted by Railway Express under Rule No. 18. The United States Government approved TAPE-STRAP for domestic packaging by announcing a new Military Specification MIL-T-4601 (USAF). This specification is dated February 2, 1953 and our Tape-Strap meets all requirements of this specification.

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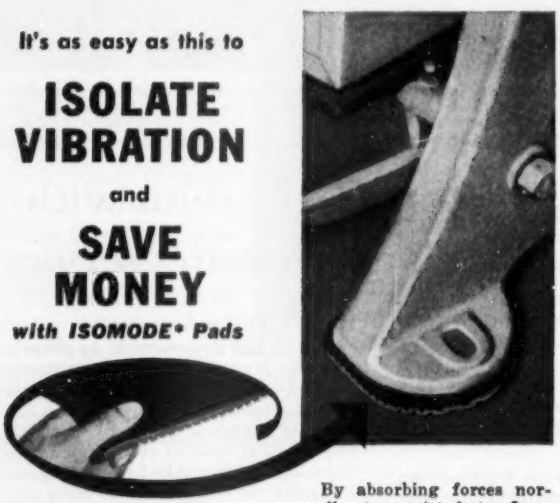

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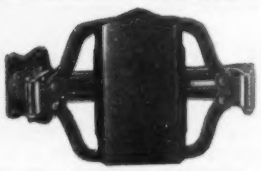

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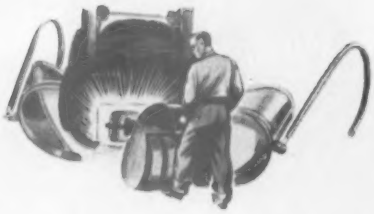

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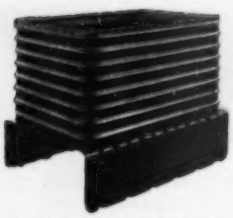

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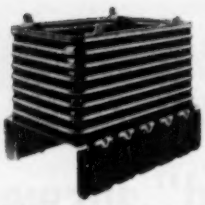

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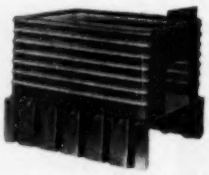

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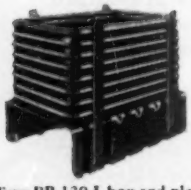
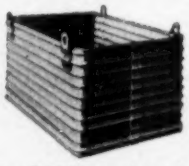
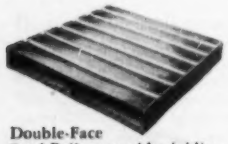


Type PB-120-L box and platform units with full length lifting lugs.



Type B-80C box units equipped for crane handling; corrugated bottom.



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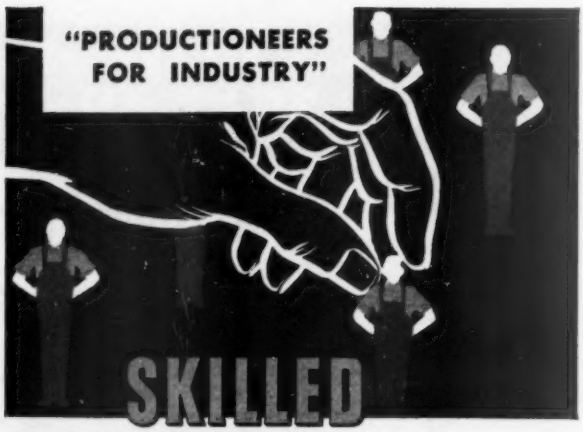

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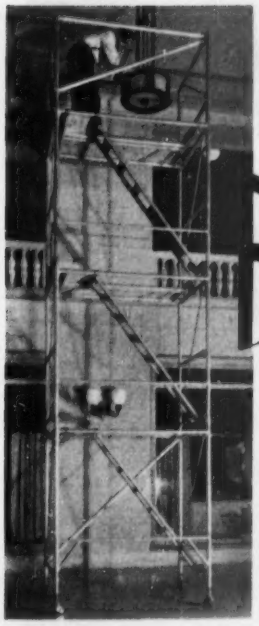

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FOLD-A-WAY

TRADE MARK

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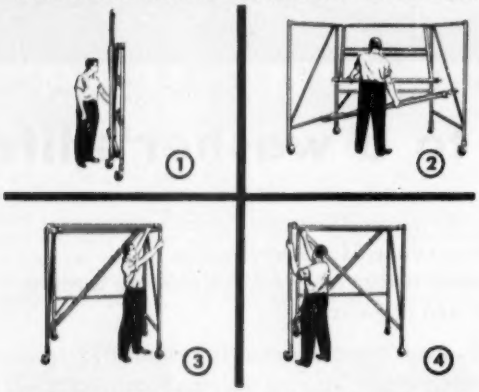
ALUMINUM

Underwriters' Laboratories approved

HERE'S WHY: For erection, the end frames of this new aluminum scaffold swing open sideways, as shown below. Maximum swing of any component is 90 degrees, so the erector is always *within* the base area. One man erects the base section in less than a minute.



The FOLD-AWAY Aluminum Scaffold stands freely and will not "fold under" during erection. Superior construction features include coped and *full-welded* joints LOKT-RING adjustable legs with casters that lock at both wheel and swivel.

Write for illustrated Bulletin ASF-1

Aluminum Sectional Ladder Scaffolds are extremely mobile. 24" width permits use in restricted areas. 6', 8' and 10' spans; ladders 4'3", 5'8" and 6'1" high, slip together easily for desired height. Underwriters' Laboratories approved. Write for Bulletin AS-2.

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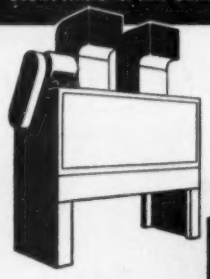

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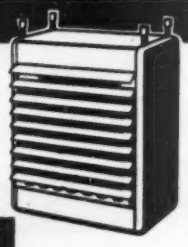

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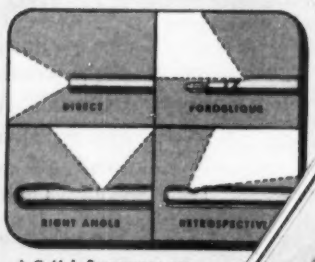
for close-up visual inspection of internal surfaces and hidden parts



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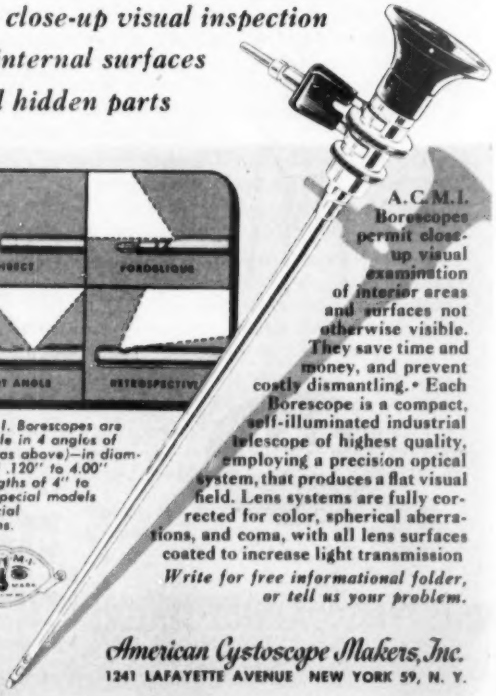

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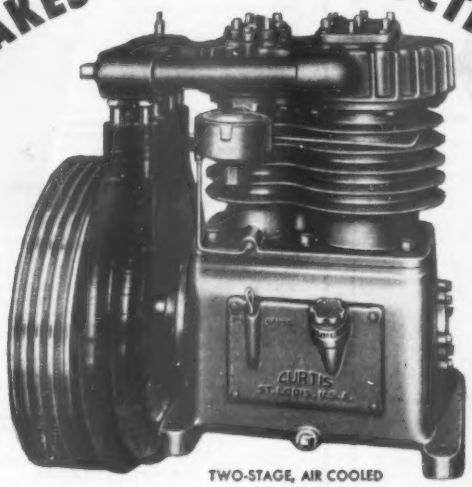

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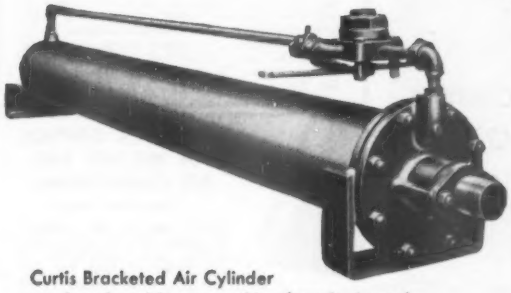

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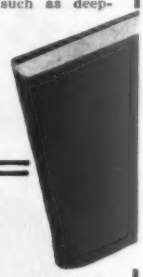

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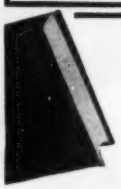

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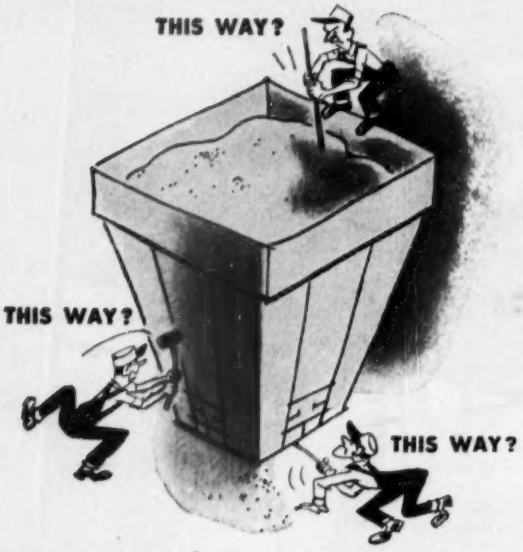

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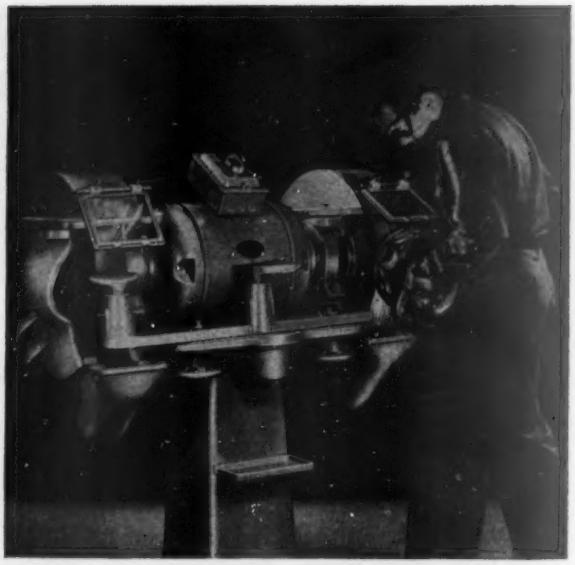

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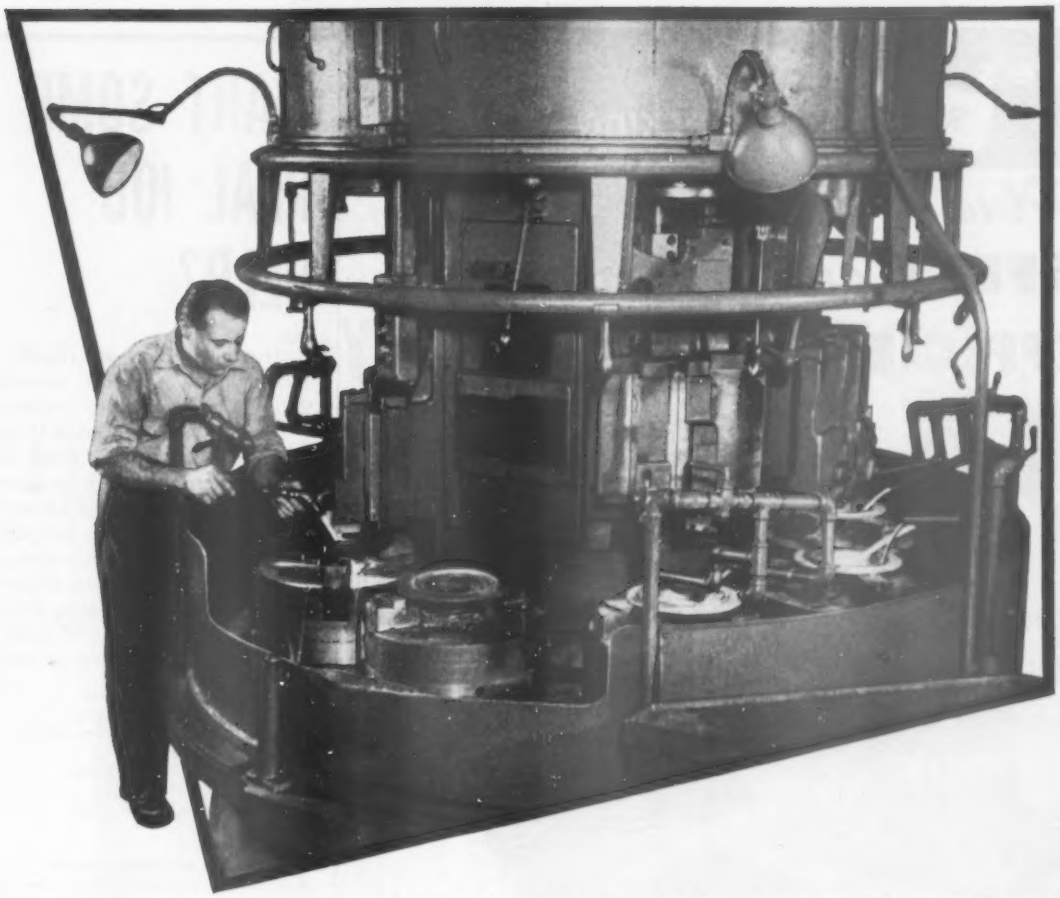

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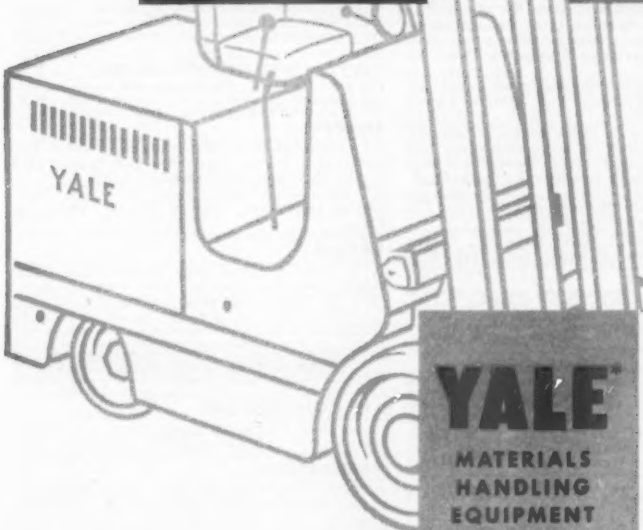

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Horizontal: Bement, 3" bar, table size 24"x48". Lobile Mach'y Co., 151 Baxter St., N. Y., N. Y.

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Vert. Hyd. 12 ton American No. V50, pull type, late machine, taken out of operation. Botwinik Bros., Inc., Welton Parkway, New Haven, Conn.

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21" Potter & Johnson No. 4D, MD high speed excell. cond. Botwinik Bros., Inc., Welton Parkway, New Haven, Connecticut.

Bullard #16—23", 8 spindle, vertical mult-automatic. Botwinik Bros., Inc., Welton Pkwy., New Haven, Conn.

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Pfauter 118"x22" Spur, Helical, Worm & Herringbone, Automatic M.D. Botwinik Bros. of Mass., Inc., 7 Sherman St., Worcester, Massachusetts.

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Surface: #2 Reid, 6" x 18" Capacity Magnetic Chuck Motor, New 1940. Fitzpatrick and Walsh, 2439 N. 9th St., Phila. 33, Penna.

Surface: No. 16A Blanchard MD, vert. dial loading. Botwinik Bros., Inc., Welton Parkway, New Haven, Conn.

Surface: Gallmeyer & Livingston No. 65 Hyd. with coolants. Aaron Machinery Co., 47 Crosby St., N. Y.

Surface: 12" x 24" Thompson Hydraulic. All-State Machinery Corp., 183 Centre St., New York, N. Y.

Thread: Jones & Lamson Mod. T.G.-615 with truing device, helix att. cpl. with motors. Aaron Machinery Co., 47 Crosby St., N. Y.

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LATHES, TURRET

#1L Gisholt, Universal, 1943, indexing turret. Jayco Machine Co., 136 Liberty St., New York 6.

No. 5 W. & S. univ. Sr. 450163 Bar & Chuck., All-State Machinery Corp., 183 Centre St., New York, N Y.

#3 Warner & Swasey, Universal, Serial No. 454365. Jayco Machine Co., 136 Liberty St., N.Y.C.

#3R & #4A Libby, bar feed, 1941. Jayco Machine Co., 136 Liberty Street, New York 6, N.Y.

#3R—6¼" Gisholt, M.D., Turret Lathe. Botwinik Bros., Inc., Welton Pkwy., New Haven Conn.

#2G Morey, power feed, to turret, 1941. Bargain price. Jayco Machine Co., 136 Liberty St., N.Y.C.

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Kent-Owens—No. 1-14 double spindle. Aaron Machinery Co., 47 Crosby St., New York, N. Y.

Production: #00 Sundstrand Rigidmil, Ser. No. 50-362. Lobile Mach'y Co., 151 Baxter St., N. Y., N.Y.

Production: No. 08 Cincinnati, Pl. Horiz., MD, with rise and fall attach (several). Botwinik Bros., Inc., Welton Pkwy., New Haven, Conn.

Thread: 6" x 80" Pratt and Whitney, Motor Driven. Thread Miller. Botwinik Bros., Inc., Welton Parkway, New Haven, Connecticut.

Vert: 40# index, Ser. No. 403330. Lobile Mach'y Co., 151 Baxter St., N. Y., N. Y

Vertical: No 2 Maximiller, late, power feed all direction Aaron Machinery Co., 47 Crosby St., New York 12, N. Y.

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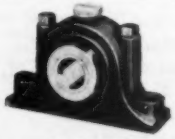

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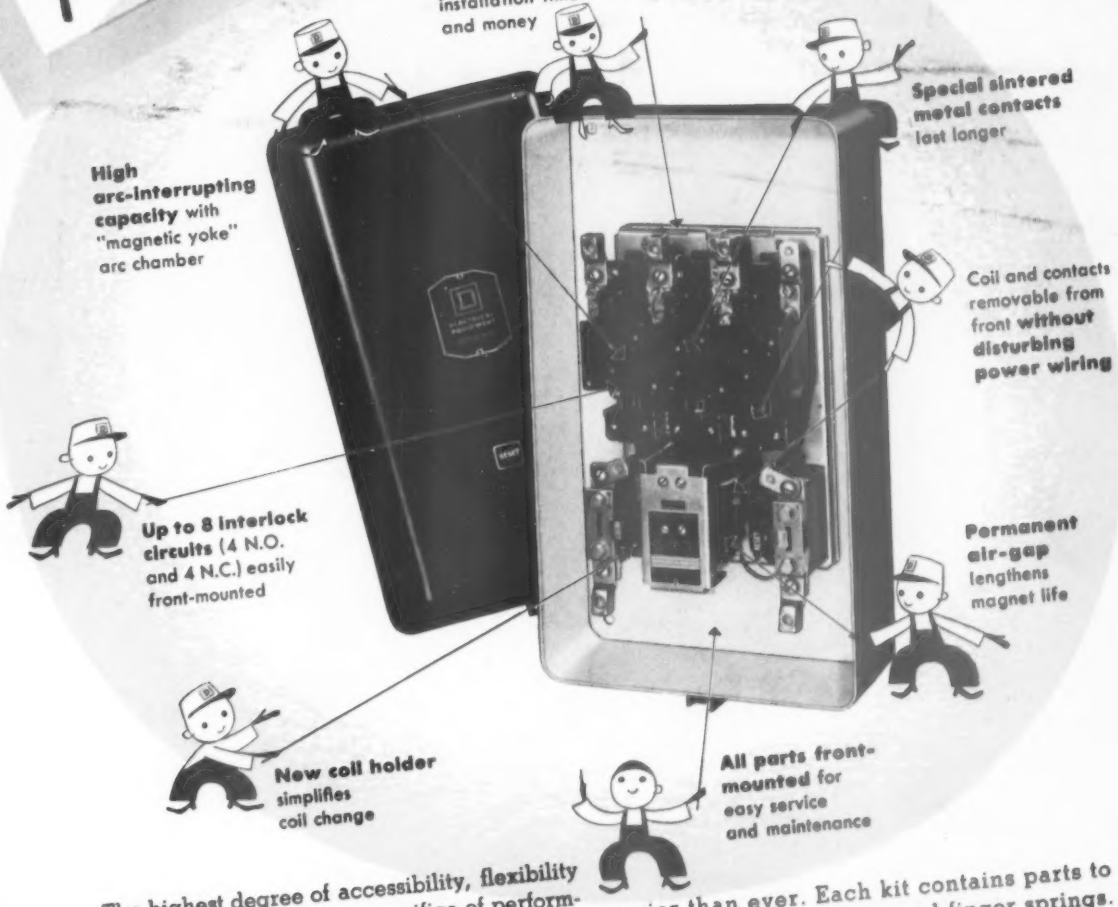
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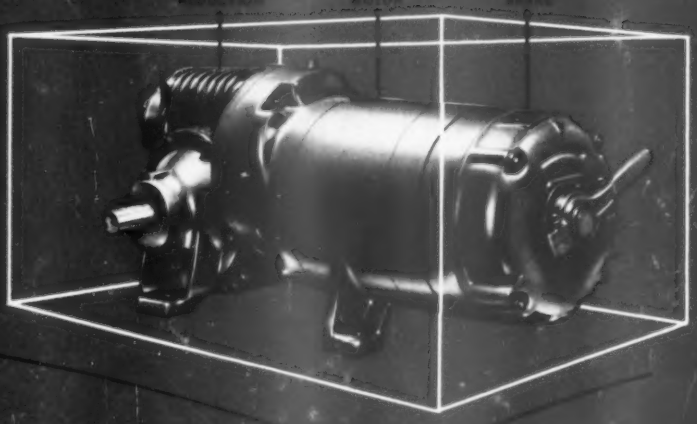

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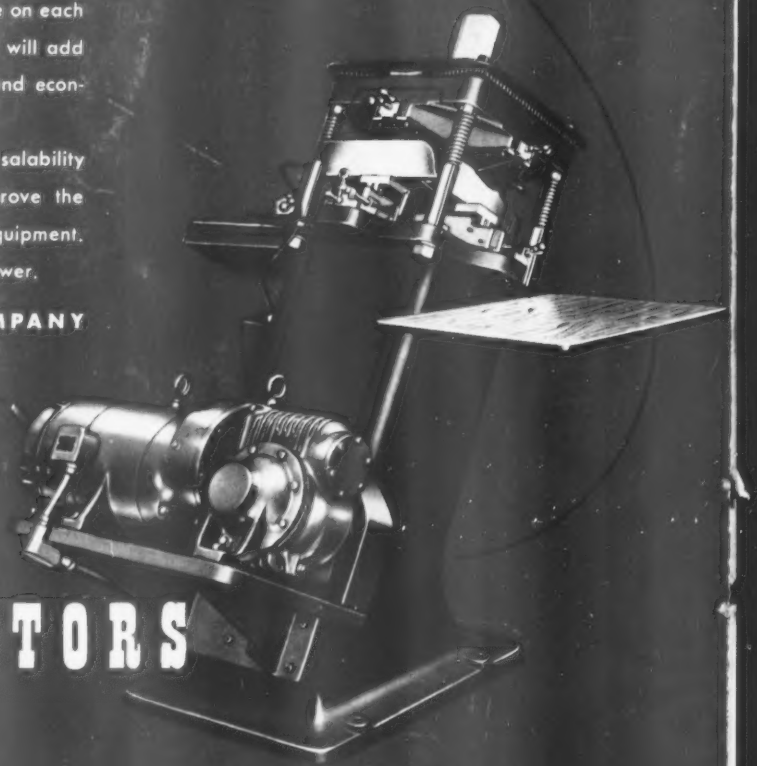

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